



**कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK**

1. 'दिगंत' या शब्दाच्या संधीचा खालील योग्य पर्याय निवडा.

- (1) दिग + अंत (2) दिग् + अंत (3) दिगः + अंत (4) दिक् + अंत

2. 'पांग फेडणे' या वाक्प्रचाराचा अचूक अर्थ असलेला पर्याय कोणता ?

- (a) मनोरथ सफल करणे (b) इच्छा पूर्ण करणे  
(c) पंगूपणा दूर करणे (d) चिंता दूर करणे

पर्यायी उत्तरे :

- (1) (a) फक्त बरोबर बाकी सर्व चूक (2) (c) व (d) बरोबर बाकी सर्व चूक  
(3) (a), (b) व (d) बरोबर (c) चूक (4) (a) व (d) बरोबर बाकी सर्व चूक

3. 'नागरिकाने आपणाला राष्ट्रभक्त मानले पाहिजे' या वाक्यातील सर्वनाम प्रकार ओळखा.

- (a) दर्शक सर्वनाम (b) संबंधी सर्वनाम  
(c) आत्मवाचक सर्वनाम (d) प्रश्नार्थक सर्वनाम

पर्यायी उत्तरे :

- (1) (a) फक्त बरोबर बाकी सर्व चूक (2) (b) फक्त बरोबर बाकी सर्व चूक  
(3) (c) फक्त बरोबर बाकी सर्व चूक (4) (d) फक्त बरोबर बाकी सर्व चूक

4. (i) उद्यापासून परीक्षा सुरू होईल.

(ii) विश्वास परीक्षेत वर्गात पहिला आला म्हणून वर्गशिक्षकांनी त्याला बक्षीस दिले.

(iii) जर परीक्षा नसत्या तर मुलांनी अभ्यास केल्या नसता.

वरील वाक्यांमधून मिश्रवाक्य ओळखा.

- (a) पहिले वाक्य मिश्रवाक्य (b) दुसरे वाक्य मिश्रवाक्य  
(c) तिसरे वाक्य मिश्रवाक्य (d) वरीलपैकी एकही नाही

पर्यायी उत्तरे :

- (1) (a) बरोबर बाकी सर्व चूक (2) (b) बरोबर बाकी सर्व चूक  
(3) (c) बरोबर बाकी सर्व चूक (4) (d) बरोबर बाकी सर्व चूक

5. खालीलपैकी विशेषणांचा गट ओळखा.

- (a) प्रेरणा, संवाद (b) शुभ्र, रेखीव (c) जिंकली, येते (d) म्हणून, अथवा

पर्यायी उत्तरे :

- (1) (a) व (b) बरोबर बाकी सर्व चूक (2) (c) बरोबर बाकी सर्व चूक  
(3) (b) बरोबर बाकी सर्व चूक (4) (d) बरोबर बाकी सर्व चूक

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**पुढील उतारा वाचून त्यावरील प्रश्नांची उत्तरे लिहा. ( प्र.क्र. 6 ते 10 )**

शरीरातील पेशींना सूक्ष्मदर्शक यंत्राखाली तपासतांना त्यांच्या रचनेतील निसर्गदत्त सुबकता व सौंदर्य जाणवते. ही सुबकता येते शिस्तपालनामुळे. शिस्त मोडून, वेड्यावाकड्या अस्ताव्यस्त पसरलेल्या पेशी म्हणजे कर्करोगाची सुरुवात. पेशींची बेसुमार वाढ आणि तीदेखील प्रचंड वेगाने होणे हे कर्करोगाचे दुसरे लक्षण असते. ही झटपट, बेसुमार अनियंत्रित वाढ ही रोगट असते. अभद्र असते.

हल्लीच वाचण्यात आलं होतं की एक तहसीलदार पदावरची मुलगी, तिच्या लॉकरमध्ये सोन्याची बिस्किट व भरपूर मालमत्ता सापडली. काय वय त्या मुलीचं? शासकीय सेवेत येऊन किती वर्षे झालेली? इतक्या झटपट मालमत्ता एवढी वाढतेच कशी? ही वाढ रोगट असते. प्रत्येकाला एका रात्रीतच श्रीमंत अन् प्रसिद्ध व्हायचं असतं. वाट पाहण्याची कुणाचीच तयारी नाही. विनाअनुदानित शिक्षणव्यवस्थेमुळे, गुणवत्ता महत्त्वाची उरलीच नाहीय. शिक्षणदेखील एक उद्योगच झाला आहे. पैसा देऊन शिकायचे व शिकून पैसा कमवायचा, यालाच विद्यार्थी जगणे समजतात. पूर्वीच्या काळी शाळेचे मुख्याध्यापकदेखील पायी चालत शाळेत येत असत. पण आज साधे राहणीमान व पायी चालणे प्रतिष्ठेचे समजले जात नाही. आज उद्योग, व्यवसाय सुरू केला की उद्या गाडी हवी, बंगला हवा हे सूत्र झालेय जगण्याचे. ही घाई, ही गती संकटसूचक आहे. जगण्याचा अर्थ न कळण्याचेच हे लक्षण आहे. एखादे पुस्तक लिहिले की लोक स्वतःला थोर लेखक समजू लागतात. छोट्या छोट्या सामान्य पुस्तक निर्मितीला, ग्रंथनिर्मिती संबोधू लागतात. अभ्यास, साधना, ग्रंथ, अभिजात साहित्य, सुप्रसिद्ध, हृदयसम्राट या शब्दांना आपण फारच स्वस्त करून टाकले आहे. एखाद्या कवितेला चार लोकांनी नावाजले की, भराभर पुस्तके लिहिण्याची घाई केली जाते. याही पुढे जाऊन, पुरस्कारांवर नजर ठेवून पुस्तके घाईघाईने प्रकाशित केली जातात. ही सगळी घाई मला कर्करोगाचे लक्षण वाटते. व्यक्ती-व्यक्तीमधील नात्यांमध्ये देखील अशीच झटपट घाई दिसून येते. नव्या पिढीतील मुला-मुलींमध्ये खूप मोकळेपणा आला आहे. तो स्वागताह आहे. परंतु प्रेमात पडण्याची घाई अन् पुन्हा ब्रेकअप करण्याची देखील घाई! सोशिकपणा, वाट पाहणे, थोडे थांबून विचार करणे, या गोष्टी कालबाह्य होत आहेत. एखादी गोष्ट मनाविरुद्ध झाली की नैराश्याचा झटका येणे, घर सोडून जावेसे वाटणे, कुठल्यातरी व्यसनाच्या आहारी जाणे, हे योग्य नव्हे. थोडे थांबण्याची तयारी हवीच. 'आज असे आहे, उद्या हे बदलेल' असा संयम असायला हवा. पण प्रतीक्षा करण्याची तयारी नाही. तित्तीक्षा शब्दाची तर ओळखच कुणाला नाही. 'इन्स्टंट' फूडचा जमाना आहे. चोवीस तास माणसे हेच पाहतात. एक साबणाची वडी घरी आणली की बाई देखणी होते. एक फरशी स्वच्छ करणारे औषध घरी आणले की घर चकचकीत होते, 'सिर्फ दो मिनट' ही भाषा भविष्यातील महासंकटाची सूचक आहे. आपल्याला जाग येणे गरजेचे आहे.

'साधना' हा शब्द खूप महत्त्वाचा आहे. तो शब्द अन् त्याचा अर्थ कळला तर जीवन समृद्ध होते. पण कोणत्याही शिक्षणक्रमाच्या प्रवेशासाठीच्या कोचिंग क्लासेसकडे पाहिले तर लक्षात येते की, केवळ परीक्षेतील यशाकडे डोळे ठेवून अभ्यास केला जातो. 'झटपट इंग्रजी शिका' काहीही झटपटच शिका, असेच तमाम जनता म्हणतेय. ही सगळी घाई मला खूपच भीतिदायक वाटते. समाजाच्या कर्करोगाची चाहूल लागतेय. काही काही क्षेत्रात तर या झटपट अन् अनियंत्रित घाईमुळे कर्करोग शेंवटच्या टप्प्यात पोचलाय असेही वाटते.

6. कर्करोग आणि कोणतीही गोष्ट झटपट होण्याची घाई यातील साम्य कोणते ?

- |                      |                         |
|----------------------|-------------------------|
| (a) घातकता आणि विनाश | (b) निरोगीपणाला आमंत्रण |
| (c) तित्तीक्षा       | (d) यशाचे सूचन          |

पर्यायी उत्तरे :

- |                                      |                                  |
|--------------------------------------|----------------------------------|
| (1) फक्त (a) आणि (d) बरोबर           | (2) फक्त (a) चूक बाकी सर्व बरोबर |
| (3) (b), (c), (d) चूक फक्त (a) बरोबर | (4) फक्त (d) चूक बाकी सर्व बरोबर |

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7. प्रस्तुत उताऱ्यासाठी योग्य शीर्षक कोणते देता येईल ?

- (1) कर्करोगाची चाहूल (2) समृद्धी  
(3) साधना (4) गुणवत्ता

8. जीवन समृद्ध होण्यासाठी कोणत्या गोष्टींची आवश्यकता आहे ?

- (a) साधना आणि तित्तीक्षा (b) अतिरीक्त घाई  
(c) प्रचंड वेग आणि अनियंत्रित वागणे (d) झटपट प्रसिद्धी मिळविणे

पर्यायी उत्तरे :

- (1) फक्त (a) आणि (b) बरोबर (2) फक्त (c) आणि (d) बरोबर  
(3) फक्त (a) बरोबर बाकी सर्व चूक (4) फक्त (d) बरोबर बाकी सर्व चूक

9. शरीर रचनेतील सुबकता आणि सौंदर्य कोणत्या गोष्टींमुळे येते ?

- (a) अनियंत्रित घाईमुळे (b) 'इन्स्टंट' गोष्टींचा जमाना असल्यामुळे  
(c) कोणतीही गोष्ट झटपट करण्यामुळे (d) शिस्तपालनामुळे

पर्यायी उत्तरे :

- (1) फक्त (a) बरोबर (2) फक्त (d) बरोबर  
(3) फक्त (c) बरोबर (4) फक्त (b) बरोबर

10. पुढीलपैकी बरोबर वाक्य कोणते ?

- (a) गुणवत्ता महत्त्वाची झाल्यामुळे शिक्षण हा उद्योग झालेला आहे.  
(b) पूर्वी शाळेचे मुख्याध्यापकदेखील पायी चालत शाळेत येत कारण त्यात प्रतिष्ठा नव्हती.  
(c) सोशिकपणा, वाट पाहणे, थोडे थांबून विचार करणे, या गोष्टी कालबाह्य होत आहेत.  
(d) झटपट बेसुमार मालमत्तेची वाढ नियंत्रित असते.

पर्यायी उत्तरे :

- (1) फक्त (d) बरोबर (2) फक्त (c) बरोबर  
(3) फक्त (a) बरोबर (4) फक्त (b) चूक

11. Match the words of **Column A** with meanings of **Column B**.

- | <b>Column A</b>           |                      | <b>Column B</b>                |  |
|---------------------------|----------------------|--------------------------------|--|
| (a) To be in the swim     | (i) Condemn          | (ii) To be in the main current |  |
| (b) To be in keeping with | (iii) Harmonize with | (iv) Retire                    |  |
| (c) To Draw off           |                      |                                |  |
| (d) To cry down           |                      |                                |  |

**Answer Options :**

- |     | (a)  | (b)   | (c)   | (d)   |
|-----|------|-------|-------|-------|
| (1) | (ii) | (iii) | (iv)  | (i)   |
| (2) | (i)  | (ii)  | (iii) | (iv)  |
| (3) | (iv) | (ii)  | (i)   | (iii) |
| (4) | (i)  | (iv)  | (iii) | (ii)  |

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12. Hard work is necessary, for you to get promotion.

Select the correct compound sentence of the above.

- (1) Working hard is necessary for you to get promotion.
- (2) If you work hard you will get promotion.
- (3) Unless you work hard you won't get promotion.
- (4) You must work hard or you will not get promotion.

13. 'Achilles Heel' means \_\_\_\_\_.

- (a) Weakness      (b) Anger      (c) Strength      (d) Advantage

**Answer Options :**

- (1) (c) only      (2) (d) only      (3) (a) only      (4) (b) and (d) only

14. Match the words of **Column A** with meanings in **Column B**.

**Column A**

**Column B**

- |                  |                        |
|------------------|------------------------|
| (a) To be at sea | (i) studded with       |
| (b) Come round   | (ii) in uncertain mind |
| (c) Do up        | (iii) pack up          |
| (d) Set with     | (iv) recover           |

**Answer Options :**

- |     |            |            |            |            |
|-----|------------|------------|------------|------------|
|     | <b>(a)</b> | <b>(b)</b> | <b>(c)</b> | <b>(d)</b> |
| (1) | (i)        | (ii)       | (iv)       | (iii)      |
| (2) | (ii)       | (iv)       | (iii)      | (i)        |
| (3) | (iv)       | (iii)      | (ii)       | (i)        |
| (4) | (iii)      | (i)        | (iv)       | (ii)       |

15. They used a rope to climb the building

The passive voice of the above sentence is \_\_\_\_\_.

- (a) A rope is being used for building
- (b) A rope was used by them to climb the building
- (c) They were using the rope to climb the building
- (d) A rope was being used to climb the building

**Answer Options :**

- (1) (a) only      (2) (b) only  
 (3) (c) and (d) only      (4) (a) and (d) only

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**Read the following passage carefully and answer the questions on it.  
(Q.No. 16 to 20)**

Economists, ethicists and business sages persuade us that honesty is the best policy, but their evidence is weak. We hoped to find data that would support their highest standards of business behaviour. To our surprise, our pet theories failed to stand-up. Treachery, we found, can pay. There is no compelling economic reason to tell the truth or seek one's word punishment for the treacherous in the real world is neither swift nor sure.

Honesty is, in fact, primarily a moral choice. Business people do tell themselves that, in the long run, they will do well by doing good. But there is little factual or logical basis for this conviction. Without values, without a basic preference for right over wrong, trust based on such self-delusion would crumble in the face of temptation. Most of us choose virtue because we want to believe in ourselves and have others, respect and belief in us.

And for this, we should be happy. We can be proud of a system in which people are honest because they want to be, not because they have to be. Materially, too trust based on morality provides great advantages. It allows us to join in great and exciting enterprises that we could never undertake if we relied on economic incentives alone.

Economists tell us that trust is enforced in the market place through retaliation of reputation. If you violate a trust your victim is apt to seek revenge and others are likely to stop doing business with you, at least under favourable terms. A man or woman with a reputation for fair dealing will prosper. Therefore, profit maximizers are honest. This sounds plausible enough until you look for concrete examples. Cases that apparently demonstrate the awful consequences of trust turns out to be few and weak, while evidence that treachery can pay seems compelling.

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**16.** Which is the material advantage which the author sees in being honest ? It permits one to :

- (1) understand activities which may not be economically attractive.
- (2) be honest for the sake of honesty alone.
- (3) make a lot of profit in various areas.
- (4) none of these.

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**17.** Why do businessmen, according to economists remain honest ? Because dishonest businessmen :

- (1) are flogged in the market place.
- (2) are always prosecuted.
- (3) can make more money.
- (4) cannot stay in business for long.

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**18.** The phrase 'stand-up' as used in the passage means :

- (1) hold up
- (2) get up
- (3) supported
- (4) get established

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19. What do economists and ethicists want us to believe ?

- (1) Businessmen are honest only at times.
- (2) Businessmen should be honest at all times.
- (3) Businessmen cannot be honest at all times.
- (4) Businessmen turn dishonest at times.

20. Why does the author say that one can be proud of the present situation ?

Because people are :

- |                     |                               |
|---------------------|-------------------------------|
| (1) respect seekers | (2) honest without compulsion |
| (3) unselfish       | (4) self-respecting           |

21. 14 मार्च 1952 रोजी \_\_\_\_\_ यांच्या सहकार्याने डॉ. बालीगा यांनी सुप्रसिद्ध सोविएत सांस्कृतिक संघाची स्थापना केली.

- (a) डॉ. किचलू
- (b) साहिबसिंग सोखे
- (c) सरोजिनी नायडू
- (d) रामेश्वरी नेहरू
- (e) अरुणा असफ अली

पर्यायी उत्तरे :

- |                             |                             |
|-----------------------------|-----------------------------|
| (1) (a), (b), (c) फक्त      | (2) (a), (b), (d) फक्त      |
| (3) (b), (c), (d), (e) फक्त | (4) (a), (b), (d), (e) फक्त |

On 14<sup>th</sup> March 1952, with the cooperation of \_\_\_\_\_ Dr. Baliga established the well known Soviet Cultural Society.

- (a) Dr. Kitchlew
- (b) Sahibsingh Sokhe
- (c) Sarojini Naidu
- (d) Rameshwari Nehru
- (e) Aruna Asaf Ali

**Answer Options :**

- |                             |                             |
|-----------------------------|-----------------------------|
| (1) (a), (b), (c) only      | (2) (a), (b), (d) only      |
| (3) (b), (c), (d), (e) only | (4) (a), (b), (d), (e) only |

22. \_\_\_\_\_ यांनी पहिली कापड गिरणी सुरू केली.

- |                      |                  |
|----------------------|------------------|
| (1) कावसजी दावर      | (2) जमशेटजी टाटा |
| (3) मोरारजी गोकुळदास | (4) खटाव माकनजी  |

\_\_\_\_\_ started the first textile mill.

- |                      |                    |
|----------------------|--------------------|
| (1) Kavasji Davar    | (2) Jamshetji Tata |
| (3) Morarji Gokuldas | (4) Khatav Makanji |

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK



23. महाराष्ट्रातील खालील प्रदेशांची त्यांच्या वार्षिक सरासरी पर्जन्याच्या प्रमाणानुसार उतरत्या क्रमाने मांडणी असलेला योग्य पर्याय कोणता आहे ?

- (1) कोकण - खान्देश - विदर्भ - मराठवाडा
- (2) कोकण - विदर्भ - खान्देश - मराठवाडा
- (3) विदर्भ - कोकण - खान्देश - मराठवाडा
- (4) मराठवाडा - खान्देश - विदर्भ - कोकण

Which of the following is the correct descending order sequence of the regions in Maharashtra in terms of annual average rainfall received ?

- (1) Konkan - Khandesh - Vidarbha - Marathwada
- (2) Konkan - Vidarbha - Khandesh - Marathwada
- (3) Vidarbha - Konkan - Khandesh - Marathwada
- (4) Marathwada - Khandesh - Vidarbha - Konkan

24. महाराष्ट्रातील राष्ट्रीय महामार्गाबाबत काही विधाने खाली दिली आहेत. त्यातील सुयोग्य विधान गटाचा पर्याय निवडा.

- (a) राष्ट्रीय महामार्ग 6 हा अकोला जिल्ह्यातून जातो.
- (b) राष्ट्रीय महामार्ग 16 हा नंदूरबार जिल्ह्यातून जातो.
- (c) राष्ट्रीय महामार्ग 207 हा रत्नागिरी जिल्ह्यातून जातो.
- (d) नागपूरमध्ये राष्ट्रीय महामार्ग 69 व राष्ट्रीय महामार्ग 6 हे परस्परांना छेदतात.

पर्यायी उत्तरे :

- (1) विधाने (a) व (b) हे सत्य आहेत.
- (2) विधाने (b) व (d) हे सत्य आहेत.
- (3) विधाने (a), (c) व (d) हे सत्य आहेत.
- (4) विधाने (b), (c) व (d) हे सत्य आहेत.

Following are the statements related to National Highways in Maharashtra. Select the option which comprises of valid statement groups.

- (a) N.H. 6 passes through Akola district.
- (b) N.H. 16 passes through Nandurbar district.
- (c) N.H. 207 passes through Ratnagiri district.
- (d) Nagpur is having the intersect of N.H. 69 and N.H. 6.

**Answer Options :**

- (1) Statement (a) and (b) are correct.
- (2) Statement (b) and (d) are correct.
- (3) Statement (a), (c) and (d) are correct.
- (4) Statement (b), (c) and (d) are correct.

25. 2013-14 च्या आकडेवारीनुसार, खालीलपैकी कोणत्या राज्याचा निर्यातीतील वाटा सर्वात जास्त आहे ?

- (1) गुजरात
- (2) महाराष्ट्र
- (3) तामीळनाडू
- (4) केरळ

In 2013-14, which of the following state has highest share in export ?

- (1) Gujarat
- (2) Maharashtra
- (3) Tamil Nadu
- (4) Kerala

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

P.T.O.

26. 2011-12 च्या आकडेवारीनुसार, खालीलपैकी \_\_\_\_\_ या क्षेत्राने भारतीयांना अधिक रोजगार पुरविला.

- (1) औद्योगिक क्षेत्र (2) सेवा क्षेत्र  
(3) शेती व शेतीसंबंधित उपक्रम (4) यापैकी नाही

As per the 2011-12 Statistic, which of the following sector providing employment in largest scale to Indian people ?

- (1) Industrial sector (2) Service sector  
(3) Agriculture and Allied activities (4) None of these

27. एप्रिल 1980 मध्ये पुढीलपैकी कोणत्या बँकांचे राष्ट्रीयीकरण करण्यात आले ?

- (a) सेंट्रल बँक ऑफ इंडिया आणि कॅनरा बँक  
(b) इंडियन बँक आणि अलाहाबाद बँक  
(c) कॉर्पोरेशन बँक आणि ओरिएंटल बँक ऑफ कॉमर्स  
(d) देना बँक आणि यूनायटेड बँक ऑफ इंडिया

पर्यायी उत्तरे :

- (1) (a) आणि (b) (2) (c) आणि (d) (3) केवळ (c) (4) केवळ (d)

Which of the following banks were nationalized in April 1980 ?

- (a) Central Bank of India and Canara Bank  
(b) Indian Bank and Allahabad Bank  
(c) Corporation Bank and Oriental Bank of Commerce  
(d) Dena Bank and United Bank of India

**Answer Options :**

- (1) (a) and (b) (2) (c) and (d) (3) Only (c) (4) Only (d)

28. सन 1987-88 ते 2010-11 काळाच्या दरम्यान पेट्रोलियम निर्यातदार देशांच्या संघटनेशी (OPEC) भारताचा आयात-निर्यात व्यापार \_\_\_\_\_ आहे.

- (1) सातत्याने वाढत आहे (2) सातत्याने घटत आहे  
(3) कोणताही बदल नाही (4) यापैकी नाही

Since 1987-88 to 2010-11 India's Import-Export trade with The Organisation of the Petroleum Exporting Countries (OPEC) is \_\_\_\_\_.

- (1) Continuously Increasing (2) Continuously decreasing  
(3) There is no change (4) None of the above

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

29. सहाव्या पंचवार्षिक योजनेतील दारिद्र्याच्या व्याख्येनुसार ग्रामीण भागात \_\_\_\_\_ कॅलरी आणि शहरी भागात \_\_\_\_\_ कॅलरी मिळवून देणारा आहार आवश्यक आहे.

- (1) ग्रामीण 2400 आणि शहरी 2100      (2) ग्रामीण 2200 आणि शहरी 2300  
(3) ग्रामीण 2400 आणि शहरी 2300      (4) ग्रामीण 2200 आणि शहरी 2400

According to the definition of Absolute Poverty in 6<sup>th</sup> Five Year Plan, everyday intake of foods in rural areas \_\_\_\_\_ calories and \_\_\_\_\_ calories in urban areas are essential.

- (1) Rural 2400 and Urban 2100      (2) Rural 2200 and Urban 2300  
(3) Rural 2400 and Urban 2300      (4) Rural 2200 and Urban 2400

30. खालीलपैकी कोणती अपारंपारिक ऊर्जा साधने आहेत ?

- (a) नैसर्गिक वायू आणि वीज  
(b) पवन ऊर्जा आणि बायोगॅस  
(c) भू-औष्णिक ऊर्जा आणि सौर ऊर्जा  
(d) कोळसा आणि पेट्रोलियम

पर्यायी उत्तरे :

- (1) (a) आणि (b)      (2) (b) आणि (c)      (3) (a) आणि (d)      (4) (c) आणि (d)

Which of the following are non-conventional power tools ?

- (a) Natural gas and Electricity  
(b) Wind power and Biogases  
(c) Geothermal energy and Solar energy  
(d) Coal energy and Petroleum energy

**Answer Options :**

- (1) (a) and (b)      (2) (b) and (c)      (3) (a) and (d)      (4) (c) and (d)

31. भारतीय राज्यघटनेच्या कितव्या भागात व कोणत्या कलमामध्ये केंद्र-राज्य आर्थिक व्यवहारासंबंधी तरतुदी करण्यात आल्या आहेत ?

- (1) सातवे परिशिष्ट - कलम 246      (2) 12 आणि 13 व्या भागात - कलम 264 ते 307  
(3) 4 था विभाग - कलम 36 ते 51      (4) 3 रा विभाग - कलम 12 ते 35

In which schedule and which Article of Indian Constitution, the provision of Central - state financial transaction is prescribed ?

- (1) Appendix - 7, Article - 246      (2) Part 12 & 13, Article - 264 to 307  
(3) Part 4<sup>th</sup>, Article - 36 to 51      (4) Part 3<sup>rd</sup>, Article - 12 to 35

कच्च्या कामासाठी जागा/**SPACE FOR ROUGH WORK**

**P.T.O.**

32. कॅबिनेट मिशन योजनेने घटना समितीची रचना सुचविली होती.

- (a) प्रांतिक विधीमंडळाद्वारे प्रमाणशीर प्रतिनिधित्वाच्या आधारे अप्रत्यक्ष निवडणूक
- (b) भारताच्या जनते मधून प्रत्यक्ष निवडणूक
- (c) प्रांतिक विधीमंडळाद्वारे नेमणूक
- (d) मर्यादित मताधिकारावर आधारित निवडणूक

वरीलपैकी कोणते विधान/विधाने बरोबर आहेत ?

- (1) (a) आणि (d)      (2) (b) आणि (c)      (3) (a) आणि (c)      (4) (c) आणि (d)

The constituent assembly was suggested by cabinet mission plan composed of :

- (a) Indirectly elected by the system of proportional representation from provincial legislatures.
- (b) Directly elected members by the people of India.
- (c) Nominated members by the provincial legislatures.
- (d) Elected by restricted and select franchise.

Which of the statement/s given above is/are correct ?

- (1) (a) and (d)      (2) (b) and (c)      (3) (a) and (c)      (4) (c) and (d)

33. पुढीलपैकी कोणाला 2019 साली 'भारत रत्न' पुरस्काराने गौरविण्यात आले ?

- (1) प्रणव मुखर्जी, पंडित मदन मोहन मालवीय, नानाजी देशमुख
- (2) प्रणव मुखर्जी, भुपेन हजारीका, नानाजी देशमुख
- (3) अटल बिहारी वाजपेयी, नानाजी देशमुख, प्रणव मुखर्जी
- (4) पंडित मदन मोहन मालवीय, सचिन तेंडुलकर, प्रणव मुखर्जी

In 2019, the 'BHARAT RATNA' award was conferred upon \_\_\_\_\_.

- (1) Pranab Mukherji, Pandit Madan Mohan Malviya, Nanaji Deshmukh
- (2) Pranab Mukherji, Bhupen Hazarika, Nanaji Deshmukh
- (3) Atal Bihari Vajpayi, Nanaji Deshmukh, Pranab Mukherji
- (4) Pandit Madan Mohan Malviya, Sachin Tendulkar, Pranab Mukherji

34. आर्क्टिक वर्तुळ पुढीलपैकी कोणत्या देशांमधून जाते ?

- (a) रशिया      (b) आईसलँड      (c) स्वीडन      (d) डेन्मार्क

पर्यायी उत्तरे :

- (1) फक्त (a), (b) आणि (c)      (2) फक्त (a), (c) आणि (d)  
 (3) फक्त (b), (c) आणि (d)      (4) (a), (b), (c), (d)

The Arctic circle passes through :

- (a) Russia      (b) Iceland      (c) Sweden      (d) Denmark

**Answer Options :**

- (1) Only (a), (b), (c)      (2) Only (a), (c), (d)  
 (3) Only (b), (c), (d)      (4) (a), (b), (c), (d)

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

35. राष्ट्रीय विज्ञान दिवस, 2020 या दिवसाची थीम (विषय) कोणती आहे ?

- (1) मेक इन इंडिया - विज्ञान व तंत्रज्ञान प्रेरणा नवकल्पना
- (2) विज्ञानातील स्त्री
- (3) लोकांसाठी विज्ञान व विज्ञानासाठी लोक
- (4) शाश्वत भविष्यासाठी विज्ञान व तंत्रज्ञान

What is the theme of the National Science Day, 2020 ?

- (1) Make in India - Science and Technology driven innovations
- (2) Women in Science
- (3) Science for the people and people for the science
- (4) Science and Technology for sustainable future

36. दिनांक 10 ते 12 जानेवारी 2020 दरम्यान 93 वे 'अखिल भारतीय मराठी साहित्य संमेलन' उस्मानाबाद येथे संपन्न झाले - जोड्या लावा.

- |                   |                          |
|-------------------|--------------------------|
| (a) अध्यक्ष       | (i) नामदेव धोंडो महानोर  |
| (b) स्वागताध्यक्ष | (ii) फ्रान्सीस दि ब्रिटो |
| (c) उद्घाटन       | (iii) नितिन तावडे        |

पर्यायी उत्तरे :

- |                                  |                                  |
|----------------------------------|----------------------------------|
| (1) (a)-(i), (b)-(ii), (c)-(iii) | (2) (a)-(iii), (b)-(ii), (c)-(i) |
| (3) (a)-(ii), (b)-(i), (c)-(iii) | (4) (a)-(ii), (b)-(iii), (c)-(i) |

The 93<sup>rd</sup> 'ALL INDIA MARATHI SAHITYA SAMMELAN' was held at Osmanabad from 10<sup>th</sup> to 12<sup>th</sup> January 2020. Match the columns.

- |                  |                           |
|------------------|---------------------------|
| (a) President    | (i) Namdeo Dhondo Mahanor |
| (b) Receptionist | (ii) Francis Dibrito      |
| (c) Inauguration | (iii) Nitin Tawde         |

**Answer Options :**

- |                                  |                                  |
|----------------------------------|----------------------------------|
| (1) (a)-(i), (b)-(ii), (c)-(iii) | (2) (a)-(iii), (b)-(ii), (c)-(i) |
| (3) (a)-(ii), (b)-(i), (c)-(iii) | (4) (a)-(ii), (b)-(iii), (c)-(i) |

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

P.T.O.

37. 25 डिसेंबर 2019 रोजी 'अटल भूजल' योजना भारतात सुरू करण्यात आली. या योजनेमध्ये कोणत्या राज्यांचा समावेश करण्यात आला ?

- (1) हरियाणा, कर्नाटक, मध्यप्रदेश, पश्चिम बंगाल.
- (2) उत्तरप्रदेश, महाराष्ट्र, जम्मू आणि काश्मिर, राजस्थान, आसाम, मणिपूर, मध्यप्रदेश.
- (3) राजस्थान, महाराष्ट्र, पश्चिम बंगाल, नागालँड, मध्यप्रदेश, उत्तरप्रदेश.
- (4) हरियाणा, कर्नाटक, गुजरात, मध्यप्रदेश, उत्तरप्रदेश, राजस्थान, महाराष्ट्र.

On 25<sup>th</sup> December 2019, 'ATAL BHUJAL' Scheme was launched in India. Which states were included in this scheme ?

- (1) Haryana, Karnataka, Madhya Pradesh, West Bengal.
- (2) Uttar Pradesh, Maharashtra, Jammu and Kashmir, Rajasthan, Assam, Manipur, Madhya Pradesh.
- (3) Rajasthan, Maharashtra, West Bengal, Nagaland, Madhya Pradesh, Uttar Pradesh.
- (4) Haryana, Karnataka, Gujarat, Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra.

38. कझाखस्तानची राजधानी अस्तानाचे नवीन नाव काय ?

- |            |          |               |          |
|------------|----------|---------------|----------|
| (1) फुरगान | (2) अरमत | (3) नूरसुलतान | (4) तराज |
|------------|----------|---------------|----------|

What is the new name of Kazakhstan's Capital Astana ?

- |            |            |               |           |
|------------|------------|---------------|-----------|
| (1) Furgan | (2) Aramat | (3) Nursultan | (4) Taraj |
|------------|------------|---------------|-----------|

39. खालीलपैकी कोणते घटक हरितगृह परिणामास जबाबदार आहेत ?

- |                        |             |
|------------------------|-------------|
| (a) जल बाष्प           | (b) वनस्पती |
| (c) कार्बन-डाय-ऑक्साईड | (d) अरगॉन   |

खालीलपैकी योग्य पर्याय निवडा.

- |                      |                 |
|----------------------|-----------------|
| (1) (a) आणि (b)      | (2) (a) आणि (c) |
| (3) (a), (b) आणि (c) | (4) (c) आणि (d) |

Which of the following factor's are responsible for greenhouse effect ?

- |                    |            |
|--------------------|------------|
| (a) Water vapour   | (b) Plants |
| (c) Carbon-dioxide | (d) Argon  |

Select the **correct** option from the following.

- |                      |                 |
|----------------------|-----------------|
| (1) (a) and (b)      | (2) (a) and (c) |
| (3) (a), (b) and (c) | (4) (c) and (d) |

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

40. खालील जोड्या लावा.

- |                    |            |
|--------------------|------------|
| (a) जल कायदा       | (i) 1981   |
| (b) वायु कायदा     | (ii) 1974  |
| (c) पर्यावरण कायदा | (iii) 1986 |

पर्यायी उत्तरे :

- |     |       |      |       |
|-----|-------|------|-------|
|     | (a)   | (b)  | (c)   |
| (1) | (i)   | (ii) | (iii) |
| (2) | (iii) | (i)  | (ii)  |
| (3) | (iii) | (ii) | (i)   |
| (4) | (ii)  | (i)  | (iii) |

Match the following.

- |                     |            |
|---------------------|------------|
| (a) Water Act       | (i) 1981   |
| (b) Air Act         | (ii) 1974  |
| (c) Environment Act | (iii) 1986 |

**Answer Options :**

- |     |       |      |       |
|-----|-------|------|-------|
|     | (a)   | (b)  | (c)   |
| (1) | (i)   | (ii) | (iii) |
| (2) | (iii) | (i)  | (ii)  |
| (3) | (iii) | (ii) | (i)   |
| (4) | (ii)  | (i)  | (iii) |

41. The percentage error in the area of an ellipse when an error of 1% is made in measuring its major and minor axes is :

(1) 1%                      (2) 4%                      (3) 2%                      (4) none of these

42. If double integral in Cartesian coordinates is given by  $\iint_R f(x, y) dx dy$ , then the value of same integral in polar form is :

- |  |  |
|--|--|
| (1) $\iint_P f(r \cos \theta, r \sin \theta) dr d\theta$     | (2) $\iint_P f(r \cos \theta, r \sin \theta) r dr d\theta$ |
| (3) $\iint_P f(r \cos \theta, r \sin \theta) r^2 dr d\theta$ | (4) $\iint_P f(r \sin \theta, r \cos \theta) dr d\theta$   |

43. The differential equation formed by  $y = A \cos x + B \sin x + 4$ , where A and B are arbitrary constants is :

- |                                  |                                  |                                  |                                  |
|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| (1) $\frac{d^2 y}{dx^2} + y = 0$ | (2) $\frac{d^2 y}{dx^2} - y = 0$ | (3) $\frac{d^2 y}{dx^2} + y = 4$ | (4) $\frac{d^2 y}{dx^2} - y = 4$ |
|----------------------------------|----------------------------------|----------------------------------|----------------------------------|

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44. For the differential equation  $y'' + 4y = \sin 2x$ , trial function for calculation of particular integral is :
- (1)  $Ax \sin 2x + B \cos 2x$                       (2)  $Ax \sin 2x + Bx \cos 2x$   
 (3)  $A \sin 2x + Bx \cos 2x$                       (4)  $A \sin 2x + B \cos 2x$
- 
45. If A is a square matrix such that  $A^2 = I$ , then  $A^{-1}$  is equal to :
- (1)  $2A$                       (2)  $0$                       (3)  $A$                       (4)  $A + I$
- 
46. The value of the double integral  $\iint xy e^{x+y} dx dy$  is :
- (1)  $ye^y(xe^x - e^x)$                       (2)  $(ye^y - e^y)(xe^x - e^x)$   
 (3)  $(ye^y - e^y)xe^x$                       (4)  $(ye^y - e^y)(xe^x + e^x)$
- 
47. General solution of  $y'' + y' - 6y = 0$  is :
- (1)  $y = C_1 e^{2x} + C_2 e^{-3x}$                       (2)  $y = C_1 e^{-3x} + C_2 e^{2x}$   
 (3)  $y = C_1 e^{6x} + C_2 e^{-x}$                       (4)  $y = C_1 e^{-6x} + C_2 e^x$
- 
48. The Partial Differential Equation  $5 \frac{\partial^2 z}{\partial x^2} + 6 \frac{\partial^2 z}{\partial y^2} = xy$  is classified as :
- (1) elliptic                      (2) parabolic                      (3) hyperbolic                      (4) none of these
- 
49. If  $f(x, y) = \sin x \cos y$ , then which of the following is a critical point ?
- (1)  $\left(\frac{\pi}{4}, \frac{\pi}{4}\right)$                       (2)  $\left(-\frac{\pi}{4}, \frac{\pi}{4}\right)$                       (3)  $\left(0, \frac{\pi}{2}\right)$                       (4)  $(0, 0)$
- 
50. The following systems have non-trivial solutions  
 $kx + 2y + 3z = 0$   
 $2x - 3y + z = 0$   
 $3x - y + 4z = 0$   
 if :
- (1)  $k = 2$                       (2)  $k = 1$                       (3)  $k = 0$                       (4) None of these
- 
51. The value of  $\int_0^4 x^2 dx$  using trapezoidal rule, divided into 4 equal subintervals, is equal to :
- (1) 22                      (2) 24                      (3) 20                      (4) 21
- 
52. If  $z$  is a homogeneous function of  $x, y$  of order  $n$ , then  $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y}$  is equal to :
- (1)  $n(n-1)z$                       (2)  $nz$                       (3)  $n/z$                       (4) none of these

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53. Volume common to the cylinders  $x^2 + y^2 = a^2$  and  $x^2 + z^2 = a^2$  is :

- (1)  $\frac{4}{3}\pi a^3$       (2)  $\frac{4}{3}\pi a^2$       (3)  $\frac{16}{3}a^3$       (4)  $\frac{16}{3}\pi a^3$

54. The Jacobian matrix of the function defined by  $f: \mathbb{R}^2 \rightarrow \mathbb{R}^2$  as  $f(x, y) = (2x^2 + 3y, 4x - 2y)$  at  $(1, -1)$  is :

- (1)  $\begin{bmatrix} 4 & 3 \\ 4 & -2 \end{bmatrix}$       (2)  $\begin{bmatrix} 4 & 4 \\ 3 & -2 \end{bmatrix}$       (3)  $\begin{bmatrix} 4 & -2 \\ 4 & 3 \end{bmatrix}$       (4) None of these

55. What is the degree of the first order differential equation given by

$$\left(\frac{dy}{dx}\right)^{1.5} = \left(\frac{x \cos x}{x^2 + \sqrt{\sin x}}\right)^3 ?$$

- (1) 1.5      (2) 1      (3) 3      (4) 0.5

56. The order and degree of the differential equation  $2x \frac{d^4 y}{dx^4} + 5x^2 \left(\frac{dy}{dx}\right)^3 - xy = 0$  is :

- (1) Fourth order, first degree      (2) Third order, first degree  
(3) First order, fourth degree      (4) First order, third degree

57. If the friction angle  $\phi_s$  is larger than the lead angle  $\theta$ , the screw is said to be :

- (1) Shear-locking      (2) Force-locking  
(3) Self-locking      (4) None of these

58. A ladder is resting on a rough ground and leaning against a smooth vertical wall. The force of friction will act :

- (1) downward at its upper end      (2) upward at its upper end  
(3) zero at its upper end      (4) perpendicular to wall at its upper end

59. The C.G. of a circular sector measured from center is at a distance of :

- (1)  $\frac{2r \sin \alpha}{3\alpha}$       (2)  $\frac{r \sin \alpha}{\alpha}$       (3)  $\frac{4r}{3\pi}$       (4)  $\frac{2r}{\pi}$

60. A block is projected along the floor with an initial velocity of 7 m/s and constant acceleration  $-3.5 \text{ m/s}^2$ . What will be the time taken by the block to come to rest and corresponding distance travelled ?

- (1) 2 s and 7 m      (2) 0.5 s and 14 m  
(3) 7 s and 7 m      (4) 2 s and 14 m

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61. A bullet is fired from a horizontal distance of 40 m measured from a bottom of a 9.81 m high vertical pole. Calculate time required for bullet to just clear upper end of the pole.

- (1) 2 sec.                      (2)  $\sqrt{2}$  sec.                      (3) 9.81 sec.                      (4)  $\sqrt{9.81}$  sec.

62. Which force system requires the one force equation in the direction of force and one moment equation about an axis normal to the plane of the forces ?

- (1) Equilibrium of collinear force system  
 (2) Equilibrium of parallel force system  
 (3) Equilibrium of general force system  
 (4) Equilibrium of concurrent force system

63. When a body is in equilibrium, then which statements are correct ?

- (a) Summation of moment about any point is equal to zero (i.e.  $\Sigma M = 0$ ).  
 (b) Summation of forces along any direction is equal to zero (i.e.  $\Sigma F = 0$ ).  
 (c) Summation of moment is not equal to zero (i.e.  $\Sigma M \neq 0$ ).  
 (d) Summation of forces is not equal to zero (i.e.  $\Sigma F \neq 0$ ).

**Answer Options :**

- (1) (a) and (d)                      (2) (b) and (c)                      (3) (a) and (b)                      (4) (b) and (d)

64. A rod (ABC) of weight 50 N and 1.5 m long is simply supported at one end (say A) and passes over roller support at B, 1 m away from end A. What will be the maximum load that can be applied at the second end of rod (say C) so that the rod does not topple ?

- (1) 25 N                      (2) 50 N                      (3) 75 N                      (4) 100 N

65. The equation of motion could be written as equilibrium equations simply by introducing inertia forces in addition to the real forces acting on a system. This idea is known as \_\_\_\_\_.

- (1) D'Alembert's principle                      (2) Principle of motion  
 (3) Newton's second law                      (4) Law of motion

66. A man weighing 800 N is in boat weighing 4000 N which is floating in a still lake. If he jumps of the boat with absolute velocity of 10 m/s, find the velocity of boat.

- (1) 2 m/s                      (2) 0.5 m/s                      (3) 1.5 m/s                      (4) 2.5 m/s

67. The slope of the velocity time diagram (i.e. v-t curve) gives \_\_\_\_\_.

- (1) Displacement  
 (2) Rate of velocity  
 (3) Acceleration  
 (4) Distance travelled by the body between time interval

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68. An airplane begins its take-off run at A with zero velocity and a constant acceleration. Knowing that it becomes airborne 30 seconds later at B and that the distance AB is 900 m. What is the acceleration and take-off velocity of airplane ?  
(1)  $1.8 \text{ m/s}^2$  and 54 m/s (2)  $2.0 \text{ m/s}^2$  and 56 m/s  
(3)  $2.0 \text{ m/s}^2$  and 60 m/s (4)  $1.8 \text{ m/s}^2$  and 60 m/s
- 
69. A rifle of 5 kg mass fires a bullet of 10 gm mass at a velocity of 300 m/s. Determine the velocity with which rifle recoils.  
(1) 0.4 m/s (2) 0.6 m/s (3) 1.0 m/s (4) 2.0 m/s
- 
70. During the impact of two moving bodies, the magnitudes of the forces and the duration of impact depend on \_\_\_\_\_.  
(a) shapes of the body  
(b) velocities of the bodies  
(c) elastic properties of the bodies.  
Which statements are correct ?  
(1) (a) and (b) (2) (a) and (c) (3) (b) and (c) (4) (a), (b) and (c)
- 
71. Course aggregate means the aggregate that are retained on :  
(1) 2.36 mm I.S. Sieve (2) 2.0 mm I.S. Sieve  
(3) 4.75 mm I.S. Sieve (4) 0.425 mm I.S. Sieve
- 
72. Seven days minimum compressive strength of cement for 53 grade OPC is :  
(1) 22 MPa (2) 37 MPa (3) 15 MPa (4) 16 MPa
- 
73. In pre-stressed concrete high strength concrete and steel are desirable because :  
(1) Results in smaller cross-section  
(2) High bearing stresses are generated in anchorage zones  
(3) The shrinkage cracks are reduced  
(4) All of the above
- 
74. According to I.S. specifications, the compressive strength of ordinary portland cement (33 grade) after three days should not be less than :  
(1) 7 MPa (2) 11.5 MPa (3) 16 MPa (4) 21 MPa
- 
75. Which I.S. code has classified the bricks \_\_\_\_\_ according to compressive strength ?  
(1) I.S. 927-2000 (2) I.S. 456-1978  
(3) I.S. 1077-1992 (4) I.S. 825-1985

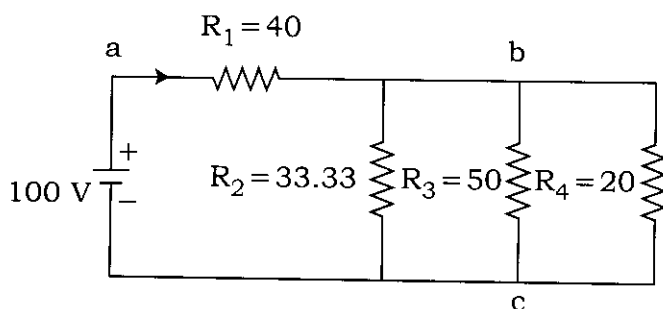
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76. What is the ratio of modulus of elasticity of steel and modulus of elasticity of concrete ?  
(1) Young modulus (2) Poisson's ratio  
(3) Modular ratio (4) None of above
- 
77. Which of the following type of stone is a clay stone with Vesicular texture ?  
(1) Granite (2) Laterite (3) Sand stone (4) Lime stone
- 
78. In respect of slenderness limits of columns as per I.S. 456-2000, the ratio of unsupported length between end restraints and least lateral dimension should not exceed :  
(1) 30 (2) 40 (3) 50 (4) 60
- 
79. Total station is a combination of :  
(1) Theodolite and compass  
(2) Theodolite and EDM  
(3) Electronic Theodolite and EDM  
(4) Electronic Theodolite and digital planimeter
- 
80. \_\_\_\_\_ is the state agency in India that prepares maps.  
(1) CPWD  
(2) Survey of India  
(3) Archaeological Survey of India  
(4) Bureau of Indian Standard
- 
81. Grinding process used for steel balls of a ball bearing is \_\_\_\_\_.  
(1) Cylindrical grinding (2) Spherical grinding  
(3) Surface grinding (4) Centerless grinding
- 
82. Coupling rod of locomotive is an inversion of :  
(1) Four bar chain (2) Single slider crank chain  
(3) Double slider crank chain (4) None of the above
- 
83. If helix angle of drill is increased then life of cutting edge \_\_\_\_\_.  
(1) increases (2) reduces  
(3) no effect (4) none of the above
- 
84. Pressurized and Boiling water reactors are used in :  
(1) Hydroelectric power plant (2) Thermal power plant  
(3) Nuclear power plant (4) None of the above
- 

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85. The shear strength of a sheet metal is 300 MPa. The blanking force required to produce a blank of 100 mm diameter from a 1.5 mm thick sheet is close to :  
 (1) 45 kN (2) 70 kN (3) 140 kN (4) 250 kN
- 
86. A pressure force acting on a fluid through a distance produces work is called \_\_\_\_\_.  
 (1) shaft work (2) steady work (3) flow work (4) none of these
- 
87. Viscosity of gases \_\_\_\_\_ with temperature.  
 (1) decrease (2) increase  
 (3) remains same (4) none of these
- 
88. Black body will emit energy at a rate proportional to \_\_\_\_\_ power of the absolute temperature of the body.  
 (1) Second (2) Third  
 (3) Fourth (4) None of the above
- 
89. Brake lining material requires \_\_\_\_\_.  
 (1) high coefficient of friction (2) low coefficient of friction  
 (3) moderate coefficient of friction (4) none of the above
- 
90. Metal ball is at 300°C and is suddenly exposed to atmosphere at 30°C. Which of the following property is not deciding its time of cooling, if the ball is considered to be a lumped mass ?  
 (1) specific heat of metal ball (2) density of metal ball  
 (3) air heat transfer coefficient (4) thermal conductivity of metal ball
- 
91. The circuit of figure involves the combination of three parallel resistors in series with the resistor  $R_1$ . For the resistance values shown, find the value of current flowing from the voltage source. All resistance values are expressed in ohms.



- (1) 2 A (2) 3 A  
 (3) 1.66 A (4) None of the above

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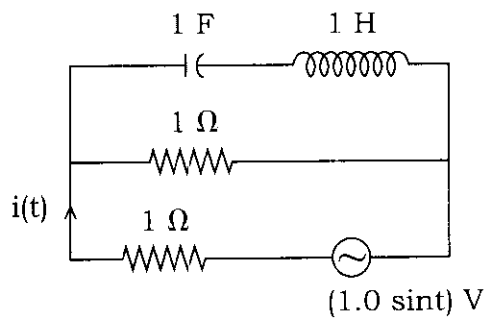
92. The power efficiency of the transformer is maximum when \_\_\_\_\_.

- (1) Copper losses greater than Iron losses
- (2) Copper losses less than Iron losses
- (3) Copper losses equals Iron losses
- (4) None of the above

93. A series circuit is said to be in electrical resonance when its \_\_\_\_\_.

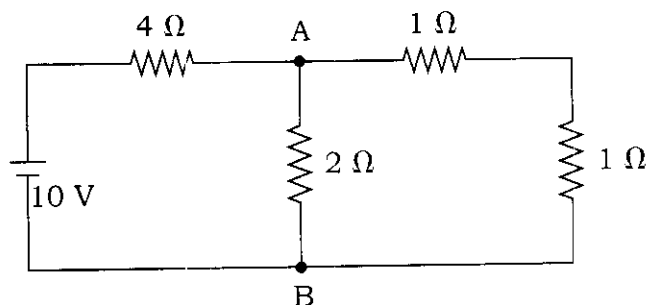
- (1) Net resistance is zero
- (2) Net impedance is zero
- (3) Net reactance is zero
- (4) None of the above

94. The RMS value of the current  $i(t)$  in the circuit shown below is :



- (1)  $\frac{1}{2}$  Amp
- (2)  $\frac{1}{\sqrt{2}}$  Amp
- (3) 1 Amp
- (4)  $\sqrt{2}$  Amp

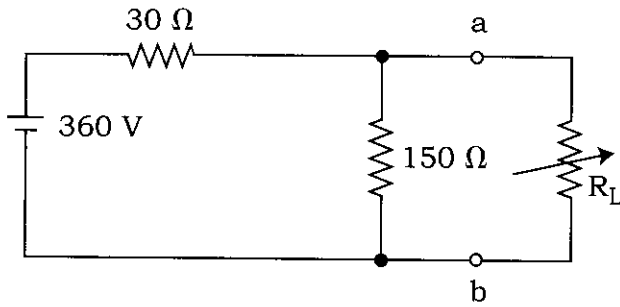
95. The Thevenin's equivalent resistance when the current is to be obtained through  $2 \Omega$  resistance in figure is :



- (1)  $5 \Omega$
- (2)  $2 \Omega$
- (3)  $1.33 \Omega$
- (4)  $1.5 \Omega$

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96. Figure shows feeding a Load  $R_L$ .



Find the value of maximum power that can be distributed in the Load  $R_L$ .

- (1) 150 W      (2) 300 W      (3) 600 W      (4) 900 W

97. The heating and lighting load supplied from three-phase supply have power factor ranging from \_\_\_\_\_.

- (1) 0.2 to 0.3      (2) 0.5 to 0.9  
(3) 0.95 to unity      (4) None of the above

98. If the full-load copper losses of a single-phase transformer is 100 W, its copper losses at half-load, 0.8 power factor will be \_\_\_\_\_.

- (1) 200 W      (2) 100 W      (3) 50 W      (4) 25 W

99. For a \_\_\_\_\_ type of load, the regulation of the transformer is negative.

- (1) Resistive      (2) Inductive  
(3) Capacitive      (4) None of the above

100. A sinusoidal alternating voltage of 50 Hz has an r.m.s. value of 200 V, the equation for instantaneous value is :

- (1)  $200 \sin 100 \pi \cdot t$       (2)  $282.2 \sin 100 \pi \cdot t$   
(3)  $200 \sin 200 \pi \cdot t$       (4) None of the above

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### सूचना — ( पृष्ठ 1 वरून पुढे.... )

- (8) प्रश्नपुस्तिकेमध्ये विहित केलेल्या विशिष्ट जागीच कच्चे काम (रफ वर्क) करावे. प्रश्नपुस्तिकेव्यतिरिक्त उत्तरपत्रिकेवर वा इतर कागदावर कच्चे काम केल्यास ते कॉपी करण्याच्या उद्देशाने केले आहे, असे मानले जाईल व त्यानुसार उमेदवारावर शासनाने जारी केलेल्या “परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचे अधिनियम-82” यातील तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एक वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.
- (9) सदर प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपल्यानंतर उमेदवाराला ही प्रश्नपुस्तिका स्वतःबरोबर परीक्षाकक्षाबाहेर घेऊन जाण्यास परवानगी आहे. मात्र परीक्षाकक्षाबाहेर जाण्यापूर्वी उमेदवाराने आपल्या उत्तरपत्रिकेचा भाग-1 समवेक्षकाकडे न विसरता परत करणे आवश्यक आहे.

### नमुना प्रश्न

प्र. क्र. 201. सतीची चाल नष्ट करण्यासाठी कोणी मूलतः प्रयत्न केले ?

- |                           |                           |
|---------------------------|---------------------------|
| (1) स्वामी दयानंद सरस्वती | (2) ईश्वरचंद्र विद्यासागर |
| (3) राजा राममोहन रॉय      | (4) गोपाळकृष्ण गोखले      |

ह्या प्रश्नाचे योग्य उत्तर “(3) राजा राममोहन रॉय” असे आहे. त्यामुळे या प्रश्नाचे उत्तर “(3)” होईल. यास्तव खालीलप्रमाणे प्रश्न क्र. 201 समोरील उत्तर-क्रमांक “③” हे वर्तुळ पूर्णपणे छायंकित करून दाखविणे आवश्यक आहे.

प्र. क्र. 201. ① ② ● ④

अशा पद्धतीने प्रस्तुत प्रश्नपुस्तिकेतील प्रत्येक प्रश्नाचा तुमचा उत्तर-क्रमांक हा तुम्हाला स्वतंत्ररीत्या पुरविलेल्या उत्तरपत्रिकेवरील त्या त्या प्रश्नक्रमांकासमोरील संबंधित वर्तुळ पूर्णपणे छायंकित करून दाखवावा. ह्याकरिता फक्त काळ्या शाईचे बॉलपेन वापरावे, पेन्सिल वा शाईचे पेन वापरू नये.

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SEAL



परीक्षेचे नांव : महाराष्ट्र अभियांत्रिकी सेवा संयुक्त (पूर्व) परीक्षा - २०२०

परीक्षेचा दिनांक : २७ मार्च, २०२१

विषय : मराठी, इंग्रजी, सामान्य अध्ययन आणि अभियांत्रिकी अभियोग्यता चाचणी

महाराष्ट्र लोकसेवा आयोगामार्फत “ महाराष्ट्र अभियांत्रिकी सेवा संयुक्त (पूर्व) परीक्षा - २०२० ” या स्पर्धा परीक्षेच्या प्रश्नपुस्तिकेची प्रथम उत्तरतालिका उमेदवारांच्या माहितीसाठी संकेतस्थळावर प्रसिध्द करण्यात आली होती. त्यासंदर्भात उमेदवारांनी अधिप्रमाणित(Authentic) स्पष्टीकरण/संदर्भ देऊन पाठविलेली लेखी निवेदने, तसेच तज्ज्ञांचे अभिप्राय विचारात घेऊन, आयोगाने उत्तरतालिका सुधारित केली आहे. या उत्तरतालिकेतील उत्तरे अंतिम समजण्यात येतील. या संदर्भात आलेली निवेदने विचारात घेतली जाणार नाहीत व त्याबाबत कोणताही पत्रव्यवहार केला जाणार नाही, याची नोंद घ्यावी.

उत्तरतालिका - KEY

प्रश्न क्रमांक	उत्तरे			
	संच A	संच B	संच C	संच D
1	4	4	4	3
2	3	3	3	4
3	3	#	3	#
4	#	3	3	3
5	3	3	#	3
6	3	1	2	3
7	1	3	2	2
8	3	2	1	1
9	2	2	3	2
10	2	3	3	3
11	1	1	2	1
12	4	4	1	4
13	3	2	4	2
14	2	2	2	3
15	2	3	3	2
16	4	2	4	2
17	4	2	4	4
18	4	4	2	2
19	2	4	2	4
20	2	4	4	4
21	4	1	4	4
22	1	4	1	1
23	2	#	2	#
24	#	2	#	2
25	1	3	1	1

प्रश्न क्रमांक	उत्तरे			
	संच A	संच B	संच C	संच D
26	3	1	2	3
27	3	2	3	1
28	1	1	1	1
29	1	3	1	3
30	2	1	3	2
31	2	#	#	#
32	#	2	2	2
33	2	2	4	2
34	4	2	4	2
35	2	4	4	3
36	4	3	2	4
37	4	4	3	4
38	3	4	2	4
39	2	4	4	2
40	4	2	2	4
41	3	1	1	3
42	2	1	2	1
43	3	2	2	3
44	2	1	3	2
45	3	3	1	3
46	2	3	3	2
47	#	#	2	#
48	1	2	3	1
49	3	3	2	2
50	2	2	3	1

# ने दर्शविलेले प्रश्न रद्द करण्यात आलेले आहेत.

प्रश्न क्रमांक	उत्तरे			
	संच A	संच B	संच C	संच D
51	1	3	3	3
52	2	2	#	1
53	3	3	1	3
54	1	1	1	2
55	1	1	1	2
56	1	2	2	1
57	3	4	1	2
58	3	2	1	3
59	1	1	1	3
60	1	1	3	3
61	2	3	3	4
62	2	1	4	2
63	3	3	1	1
64	1	1	1	3
65	1	1	3	1
66	1	3	2	1
67	3	2	2	1
68	3	2	2	2
69	2	3	3	3
70	4	3	3	1
71	3	2	3	3
72	2	4	3	3
73	4	3	2	2
74	3	3	2	4
75	3	2	2	3

प्रश्न क्रमांक	उत्तरे			
	संच A	संच B	संच C	संच D
76	3	3	4	3
77	2	3	4	2
78	4	2	3	3
79	3	3	3	4
80	2	4	3	2
81	4	2	3	4
82	1	4	2	3
83	2	3	4	1
84	3	4	2	3
85	3	3	3	3
86	3	3	4	2
87	2	2	3	2
88	3	1	1	1
89	1	1	3	3
90	4	3	1	4
91	1	3	3	4
92	3	3	4	4
93	3	4	4	1
94	2	3	3	3
95	3	3	4	3
96	4	4	1	4
97	3	2	2	2
98	4	4	3	3
99	3	3	3	3
100	4	1	3	3

Date:- 9<sup>th</sup> July,2021

- 2 -

# ने दर्शविलेले प्रश्न रद्द करण्यात आलेले आहेत.



103797

प्रश्नपुस्तिका - I

M14 संच क्र.

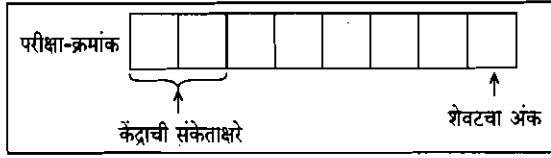
स्थापत्य अभियांत्रिकी पेपर - 1

एकूण प्रश्न : 100

एकूण गुण : 200

वेळ : 2 (दोन) तास

### सूचना

- (1) सदर प्रश्नपुस्तिकेत 100 अनिवार्य प्रश्न आहेत. उमेदवारांनी प्रश्नांची उत्तरे लिहिण्यास सुरुवात करण्यापूर्वी या प्रश्नपुस्तिकेत सर्व प्रश्न आहेत किंवा नाहीत याची खात्री करून घ्यावी. तसेच अन्य काही दोष आढळल्यास ही प्रश्नपुस्तिका समवेक्षकांकडून लगेच बदलून घ्यावी.
- (2) आपला परीक्षा-क्रमांक ह्या चौकोनांत न विसरता बॉलपेनने लिहावा.  

- (3) वर छापलेला प्रश्नपुस्तिका क्रमांक तुमच्या उत्तरपत्रिकेवर विशिष्ट जागी उत्तरपत्रिकेवरील सूचनेप्रमाणे न विसरता नमूद करावा.
- (4) या प्रश्नपुस्तिकेतील प्रत्येक प्रश्नाला 4 पर्यायी उत्तरे सुचविली असून त्यांना 1, 2, 3 आणि 4 असे क्रमांक दिलेले आहेत. त्या चार उत्तरांपैकी सर्वात योग्य उत्तराचा क्रमांक उत्तरपत्रिकेवरील सूचनेप्रमाणे तुमच्या उत्तरपत्रिकेवर नमूद करावा. अशा प्रकारे उत्तरपत्रिकेवर उत्तरक्रमांक नमूद करताना तो संबंधित प्रश्नक्रमांकासमोर छायांकित करून दर्शविला जाईल याची काळजी घ्यावी. ह्याकरिता फक्त काळ्या शाईचे बॉलपेन वापरावे, पेन्सिल वा शाईचे पेन वापरू नये.
- (5) सर्व प्रश्नांना समान गुण आहेत. यास्तव सर्व प्रश्नांची उत्तरे द्यावीत. घाईमुळे चुका होणार नाहीत याची दक्षता घेऊनच शक्य तितक्या वेगाने प्रश्न सोडवावेत. क्रमाने प्रश्न सोडविणे श्रेयस्कर आहे पण एखादा प्रश्न कठीण वाटल्यास त्यावर वेळ न घालविता पुढील प्रश्नाकडे वळावे. अशा प्रकारे शेवटच्या प्रश्नापर्यंत पोहोचल्यानंतर वेळ शिल्लक राहिल्यास कठीण म्हणून वगळलेल्या प्रश्नांकडे परतणे सोईस्कर ठरेल.
- (6) उत्तरपत्रिकेत एकदा नमूद केलेले उत्तर खोडता येणार नाही. नमूद केलेले उत्तर खोडून नव्याने उत्तर दिल्यास ते तपासले जाणार नाही. एकापेक्षा जास्त उत्तरे नमूद केल्यास ते उत्तर चुकीचे धरले जाईल व त्या चुकीच्या उत्तराचे गुण वजा केले जातील.
- (7) प्रस्तुत परीक्षेच्या उत्तरपत्रिकांचे मूल्यांकन करताना उमेदवारांच्या उत्तरपत्रिकेतील योग्य उत्तरांनाच गुण दिले जातील. तसेच "उमेदवाराने वस्तुनिष्ठ बहुपर्यायी स्वरूपाच्या प्रश्नांची दिलेल्या चार उत्तरांपैकी सर्वात योग्य उत्तरेच उत्तरपत्रिकेत नमूद करावीत. अन्यथा त्यांच्या उत्तरपत्रिकेत सोडविलेल्या प्रत्येक चुकीच्या उत्तरांसाठी 25% किंवा 1/4 गुण वजा करण्यात येतील".

### ताकीद

ह्या प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपेपर्यंत ही प्रश्नपुस्तिका आयोगाची मालमत्ता असून ती परीक्षाकक्षात उमेदवाराला परीक्षेसाठी वापरण्यास देण्यात येत आहे. ही वेळ संपेपर्यंत सदर प्रश्नपुस्तिकेची प्रत/प्रती, किंवा सदर प्रश्नपुस्तिकेतील काही आशय कोणत्याही स्वरूपात प्रत्यक्ष वा अप्रत्यक्षपणे कोणत्याही व्यक्तीस पुरविणे, तसेच प्रसिद्ध करणे हा गुन्हा असून अशी कृती करणाऱ्या व्यक्तीवर शासनाने जारी केलेल्या "परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचा अधिनियम-82" यातील तरतुदीनुसार तसेच प्रचलित कायद्याच्या तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एक वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.

तसेच ह्या प्रश्नपत्रिकेसाठी विहित केलेली वेळ संपण्याआधी ही प्रश्नपुस्तिका अनधिकृतपणे बाळगणे हा सुद्धा गुन्हा असून तसे करणारी व्यक्ती आयोगाच्या कर्मचारीवृंदापैकी, तसेच परीक्षेच्या पर्यवेक्षकीयवृंदापैकी असली तरीही अशा व्यक्तीविरुद्ध उक्त अधिनियमानुसार कारवाई करण्यात येईल व दोषी व्यक्ती शिक्षेस पात्र होईल.

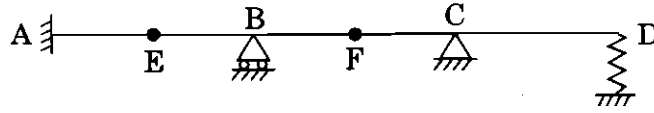
पुढील सूचना प्रश्नपुस्तिकेच्या अंतिम पृष्ठावर पहा

पर्यवेक्षकांच्या सूचनेविना हे सील उघडू नये



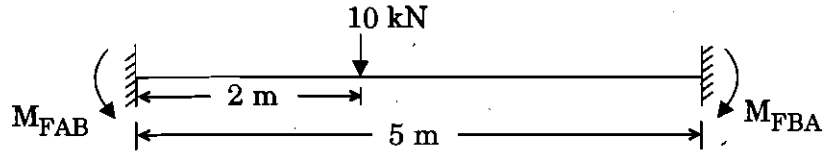
कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

1. The kinematic indeterminacy of the following beam after imposing the boundary conditions is



- (1) 6                      (2) 8                      (3) 10                      (4) 12

2. A fixed beam AB, of constant EI, shown in figure below, supports a concentrated load of 10 kN. What is the fixed end-moment  $M_{FAB}$  at support A ?



- (1) 4.8 kN.m              (2) 6.0 kN.m              (3) 7.2 kN.m              (4) 9.5 kN.m

3. Consider the following statements :

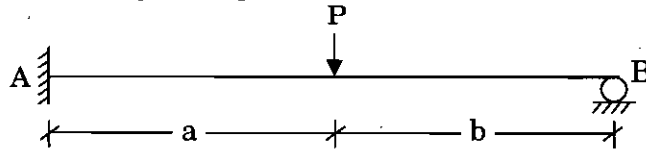
Sinking of an intermediate support of a continuous beam

- (i) Reduces the negative moment at support.  
 (ii) Increases the negative moment at support.  
 (iii) Reduces the positive moment at the centre of span.  
 (iv) Increases the positive moment at the centre of span.

Out of these above statements :

- (1) (i) and (iv) are correct                      (2) (i) and (iii) are correct  
 (3) (ii) and (iii) are correct                      (4) (ii) and (iv) are correct

4. Fixed end of propped cantilever due to a concentrated load P at a distance 'a' from fixed ends as shown in figure is given by



- (1)  $\frac{Pab(L+b)}{2L^2}$                       (2)  $\frac{Pab(L+b)}{L^2}$   
 (3)  $\frac{-Pab(L+b)}{2L^2}$                       (4)  $\frac{-Pab(L+a)}{L^2}$

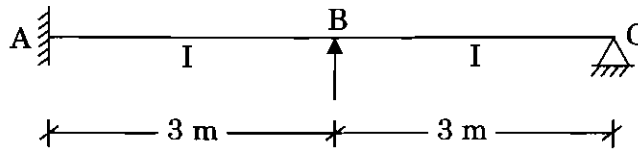
5. The sinking moment in a prismatic fixed beam whose one support yields by  $\delta$  will be where,  $l$  is length of beam

$I$  is Moment of Inertia

$E$  is Modulus of Elasticity

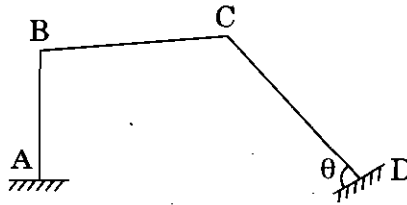
- (1)  $\frac{2 EI \delta}{l}$       (2)  $\frac{4 EI \delta}{l}$       (3)  $\frac{6 EI \delta}{l^2}$       (4)  $\frac{6 EI \delta}{l}$

6. The distribution factor for BA member in the given figure is



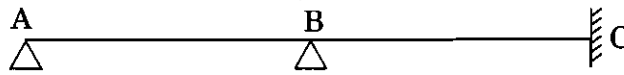
- (1)  $\frac{1}{12}$       (2)  $\frac{4}{7}$       (3)  $\frac{3}{7}$       (4)  $\frac{1}{2}$

7. In the frame shown in the figure, if lateral sway of BC is  $\Delta$ , the sway in member DC is



- (1)  $\Delta$       (2)  $\Delta \cos \theta$       (3)  $\Delta \sin \theta$       (4)  $\Delta \sec \theta$

8. Pick up the correct option from the following for the beam as shown in the figure



- a.  $M_{AB} = 0$       b.  $M_{AB} = M_{BA}$   
 c.  $M_{BA} + M_{BC} = 0$       d.  $M_{CB} = 0$
- (1) a and c are correct      (2) b and c are correct  
 (3) only d is correct      (4) only c is correct

कच्चा कामासाठी जागा / SPACE FOR ROUGH WORK

9. If the far end of the beam is fixed, the stiffness of beam with usual notations is

(1)  $\frac{2 EI}{L}$

(2)  $\frac{4 EI}{L}$

(3)  $\frac{3 EI}{L}$

(4)  $\frac{4 EI}{L^2}$

10. If three members meet at a joint and the stiffness of members are  $K_1 = EI$ ,  $K_2 = 2 EI$ ,  $K_3 = 1.5 EI$ , the distribution factor for member 1 is

(1)  $\frac{1}{3}$

(2)  $\frac{2}{7}$

(3)  $\frac{2}{9}$

(4) None of the above

11. Pick up the correct statement that corresponds to moment distributions method.

(i) Unbalanced moment is carried over to the other end of the member when the joint is released.

(ii) Carry over moment has same sign as the distribution end moments.

(1) Both (i) and (ii) are correct

(2) Only (i) is correct

(3) Only (ii) is correct

(4) Both (i) and (ii) are incorrect

12. If the central rise of a symmetrical parabolic arch is 10 m, then the rise of the arch at quarter point is

(1) 2.5 m

(2) 5.0 m

(3) 7.5 m

(4) 8.0 m

13. When a 3-hinged semi-circular arch is subjected to uniformly distributed load on entire span, the nature of bending moment at any section is

(1) Sagging only

(2) Hogging only

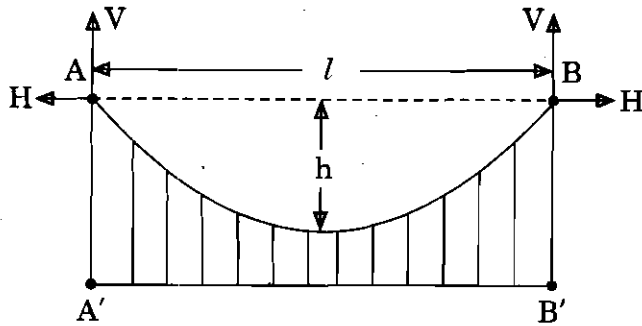
(3) Zero

(4) Partially Sagging & Partially Hogging

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

P.T.O.

14. For suspension cable with two-hinged stiffening girder as shown in figure, the influence diagram for horizontal thrust is



- (1)  $\frac{1}{l}$
- (2)  $\frac{l^2}{8h}$
- (3)  $\frac{l^3}{8h}$
- (4)  $\frac{l}{8h}$

15. The net horizontal force ( $F_H$ ) on the top of this tower and the bending moment (B.M.) at the base of the tower due to cable reaction is

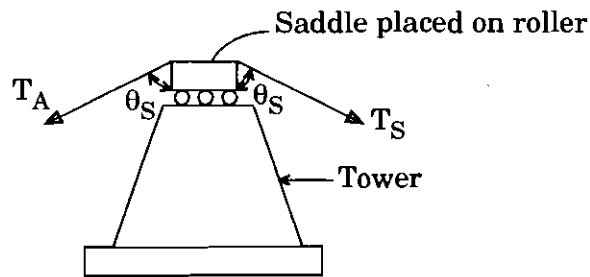


Figure : Roller support

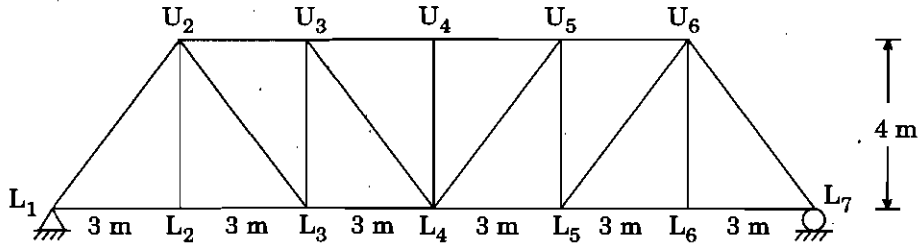
Answer options :

- (1)  $F_H = T_A \cos \theta$ , B.M. =  $T_A \sin \theta$
- (2)  $F_H = T_S \cos \theta$ , B.M. = Zero
- (3)  $F_H = \text{Zero}$ , B.M. =  $T_A \sin \theta - T_A \cos \theta$
- (4)  $F_H = \text{Zero}$ , B.M. = Zero

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK



16. A truss of panel dimensions  $3 \times n \times 4$  m is as shown in figure. The influence line diagram for the force in the member  $U_2 L_3$  is



- (1)
- (2)
- (3)
- (4)

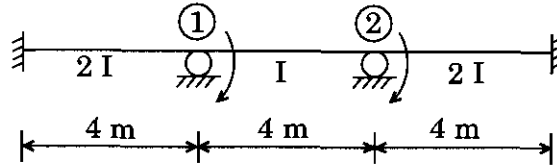
कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

P.T.O.

17. Which principle can be used to obtain the general shape of the influence lines ?

- (1) Bernoulli – Euler’s Principle                      (2) Muller – Breslau’s Principle  
 (3) Stokes’ Principle                                      (4) D’Alembert’s Principle

18. The co-ordinates for a beam are shown in figure. Stiffness matrix is given by



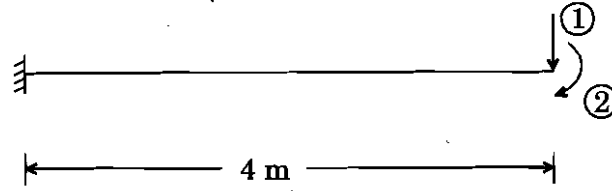
- (1)  $\begin{bmatrix} 3EI & EI \\ EI & 2EI \end{bmatrix}$                                       (2)  $\begin{bmatrix} 3EI & -0.5EI \\ -0.5EI & 2EI \end{bmatrix}$   
 (3)  $\begin{bmatrix} 3EI & 0 \\ 0 & 2EI \end{bmatrix}$                                       (4)  $\begin{bmatrix} 3EI & 0.5EI \\ 0.5EI & 2EI \end{bmatrix}$

19. For a prismatic beam element, if the stiffness matrix is  $\frac{2EI}{L} \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$ , then the flexibility matrix is

- (1)  $\frac{L}{2EI} \begin{bmatrix} 0.5 & 1 \\ 1 & 0.5 \end{bmatrix}$   
 (2)  $\frac{L}{6EI} \begin{bmatrix} 1 & -2 \\ -2 & 1 \end{bmatrix}$   
 (3)  $\frac{L}{6EI} \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$   
 (4)  $\frac{L}{3EI} \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

20. The flexibility matrix of the beam shown below is \_\_\_\_\_.



(1) 
$$\begin{bmatrix} \frac{64}{3EI} & -\frac{8}{EI} \\ -\frac{8}{EI} & \frac{64}{3EI} \end{bmatrix}$$

(2) 
$$\begin{bmatrix} \frac{64}{3EI} & \frac{8}{EI} \\ \frac{8}{EI} & \frac{16}{EI} \end{bmatrix}$$

(3) 
$$\begin{bmatrix} \frac{64}{3EI} & -\frac{8}{EI} \\ -\frac{8}{EI} & \frac{4}{EI} \end{bmatrix}$$

(4) 
$$\begin{bmatrix} \frac{64}{3EI} & \frac{8}{EI} \\ \frac{8}{EI} & \frac{4}{EI} \end{bmatrix}$$

21. For stable structures, one of the important properties of flexibility and stiffness matrices is that the element on the main diagonal

- (i) of a stiffness matrix must be negative.
- (ii) of a stiffness matrix must be positive.
- (iii) of a flexibility matrix must be positive.
- (iv) of a flexibility matrix must be negative.

**Answer options :**

- |                    |                   |
|--------------------|-------------------|
| (1) (i) and (iii)  | (2) (i) and (iv)  |
| (3) (ii) and (iii) | (4) (ii) and (iv) |

22. Flexibility matrix method of analysis is basically

- (1) Force method
- (2) Displacement method
- (3) Equilibrium method
- (4) None of the above

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23. The angle of dispersion of load in web buckling of beam is  
(1)  $30^\circ$  (2)  $33^\circ$  (3)  $40^\circ$  (4)  $45^\circ$
- 
24. In case of unequal angle section oriented with longer leg vertical, axis parallel to shorter leg of the angle and passing from centroid of cross section is \_\_\_\_\_  
(1) x - x axis (2) y - y axis  
(3) z - z axis (4) u - u axis
- 
25. Two steel plates of 100 mm width each, are lap jointed. If length of lap is 200 mm, the maximum number of 20 mm diameter bolts that can be provided for connection are \_\_\_\_\_  
(1) one (2) two (3) three (4) four
- 
26. Design of pins is primarily governed by  
(1) Shear (2) Bearing (3) Flexure (4) All of the above
- 
27. Slope of a truss is equal to  
(1) pitch/2 (2) pitch (3) 2 times pitch (4) 1.5 times pitch
- 
28. In columns, splices should be provided at  
(1) the floor levels (2) the mid height of columns  
(3) the beam-column joints (4)  $\frac{1}{4}$  height of columns
- 
29. The imperfection factor for welded steel section is  
(1) 0.21 (2) 0.35 (3) 0.42 (4) 0.49
- 
30. What is the efficiency of joint when strength of bolt per pitch length is 60 kN and strength of plate per pitch length is 150 kN ?  
(1) 25% (2) 30% (3) 35% (4) 40%
- 
31. A bolted joint may experience  
(1) shear failure  
(2) shear failure of plates  
(3) bearing failure and bearing failure of bolts  
(4) All of the above

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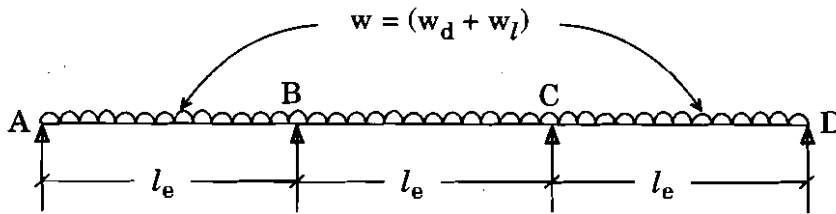
32. The partial safety factor for the material of bolt is

- (1) 1.0                      (2) 1.10                      (3) 1.15                      (4) 1.25

33. Lacing shall be designed to resist a total transverse shear equal to \_\_\_\_\_ of axial force in member.

- (1) 5%                      (2) 1%                      (3) 4.3%                      (4) 2.5%

34. A continuous beam ABCD as shown in figure is subjected to U.D.L., 'w' kN/m over all spans. What is the moment at support 'C' due to Dead Load ( $w_d$ ) and Live Load ( $w_l$ ) as per IS 456-2000 ?



- (1)  $-\left(\frac{w_d \cdot l_e^2}{10} + \frac{w_l \cdot l_e^2}{9}\right)$                       (2)  $-\left(\frac{w_d \cdot l_e^2}{12} + \frac{w_l \cdot l_e^2}{10}\right)$
- (3)  $-\left(\frac{w_d \cdot l_e^2}{12} + \frac{w_l \cdot l_e^2}{9}\right)$                       (4)  $-\left(\frac{w_d \cdot l_e^2}{16} + \frac{w_l \cdot l_e^2}{12}\right)$

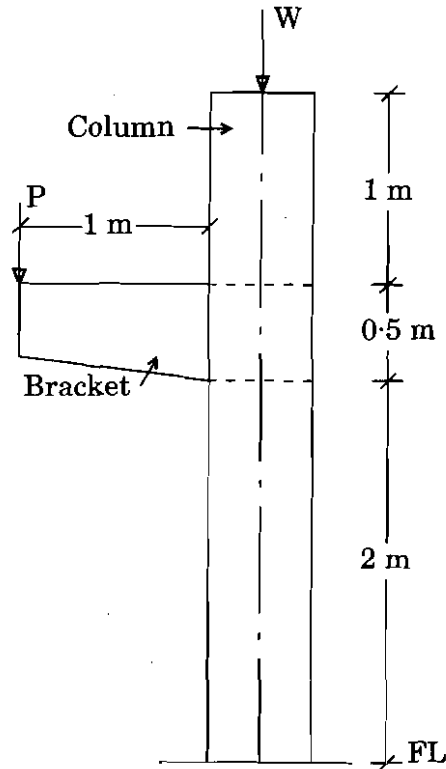
35. For two-way continuous slab of shorter span  $\leq 3.5$  m with HYSD reinforcement, the span to overall depth ratio is taken as \_\_\_\_\_ to satisfy the vertical deflection limit for loading class up to 3 kN/m<sup>2</sup>.

- (1) 26                      (2) 28                      (3) 32                      (4) 35

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36. What is the unsupported length of the column as shown in figure, if c/s of column is  $300 \text{ mm} \times 500 \text{ mm}$  and c/s of bracket is  $300 \text{ mm} \times 500 \text{ mm}$  ?



- (1) 3.5 m      (2) 3.0 m      (3) 2.5 m      (4) 2.0 m

37. A beam is designed using M20 grade of concrete and Fe415 grade of steel is used for tension reinforcement. If diameter of main steel is 12 mm, then what is the minimum value of development length ( $L_d$ ) provided in support section ?

- (1) 470 mm      (2) 564 mm      (3) 260 mm      (4) 300 mm

38. The basic maximum ratio of span to effective depth of a slab simply supported and spanning in one direction is \_\_\_\_\_ for spans up to 10 m.

- (1) 35      (2) 25      (3) 30      (4) 20

39. The horizontal distance between parallel reinforcement bars or groups, near the tension face of a beam shall not be \_\_\_\_\_ if Fe415 grade of steel is used as reinforcement without redistribution of moments.

- (1) 125 mm      (2) 150 mm  
(3) 165 mm      (4) 180 mm

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40. The thickness at the edge of footing shall be not less than \_\_\_\_\_ for footing on soil nor less than \_\_\_\_\_ above the top of the piles for footing on piles.

- (1) 100 mm, 150 mm (2) 125 mm, 200 mm  
(3) 150 mm, 300 mm (4) 150 mm, 150 mm

41. In case of stairs with open wells, where spans partly crossing at right angles occur, the load on area common to any two such spans may be taken as \_\_\_\_\_ in each direction.

- (1)  $\frac{1}{2}$  (2)  $\frac{1}{3}$  (3)  $\frac{1}{4}$  (4)  $\frac{2}{3}$

42. A circular water tank is designed to store water for 78,500 litres capacity. The water tank rests on ground with flexible joints. If M30 concrete and Fe415 steel is used, then what is the maximum hoop tension developed in water tank, if diameter and total height of tank are 5 m and 4 m respectively ?

- (1) 200 kN (2) 150 kN (3) 100 kN (4) 50 kN

43. Cantilever retaining wall is designed mainly to resist \_\_\_\_\_ from backfill.

- (1) Active earth pressure  
(2) Passive earth pressure  
(3) Uplift earth pressure  
(4) Water pressure

44. If the thickness of the slab is 160 mm, then what will be the maximum diameter of reinforcing bars that can be used as main reinforcement ?

- (1) 10 mm (2) 12 mm  
(3) 16 mm (4) 20 mm

45. The frictional and anchorage slip losses are observed in  
(1) Post-tensioned members (2) Pre-tensioned members  
(3) Ruptured members (4) Tensile members
- 
46. A simply supported prestressed concrete beam of c/s  $150 \text{ mm} \times 250 \text{ mm}$  is subjected to a superimposed load of  $5 \text{ kN/m}$  over a span of  $5 \text{ m}$ . If the prestressing force of  $750 \text{ kN}$  is applied through parabolic cable with eccentricity of  $50 \text{ mm}$  at centre and zero eccentricity at support, then what will be the extreme fibre stress at bottom fibre at end support? (Neglect the self-weight)  
(1)  $20 \text{ MPa}$  (2)  $23.68 \text{ MPa}$  (3)  $16.31 \text{ MPa}$  (4)  $26 \text{ MPa}$
- 
47. In reference to limit state of serviceability cracking, when cracking is permitted and hypothetical tensile stresses are considered in design assuming section is uncracked, it is \_\_\_\_\_.  
(1) Type-1 element (2) Type-2 element  
(3) Type-3 element (4) Type-4 element
- 
48. In the case of high tensile alloy steel bars, any straightening shall be carried out by mechanical means. Bars shall not be bent when their temperature is less than \_\_\_\_\_.  
(1)  $10^\circ$  (2)  $20^\circ$  (3)  $5^\circ$  (4)  $15^\circ$
- 
49. A post-tensioned prestressed concrete beam is stressed by three cables, each with c/s area of  $50 \text{ mm}^2$  with an initial stress of  $900 \text{ MPa}$ . If all three cables are straight and located at an eccentricity of  $50 \text{ mm}$ , consider modular ratio  $(m) = 6$  and stress in concrete at the level of steel  $(f_c) = 5 \text{ MPa}$ , then what will be the loss in stress in cables due to elastic shortening if all cables are simultaneously tensioning and anchoring?  
(1)  $90 \text{ MPa}$  (2)  $60 \text{ MPa}$  (3)  $30 \text{ MPa}$  (4)  $0$
- 
50. A rectangular concrete beam  $120 \times 300 \text{ mm}$  is prestressed by straight cable, effective force  $180 \text{ kN}$  at eccentricity  $e = 50$ , area  $36 \times 10^3 \text{ mm}^2$ ,  $z = 18 \times 10^3 \text{ mm}^3$ . Find total stress due to prestress.  
(1)  $10$  (2)  $25$  (3)  $35$  (4)  $45$
- 
51. The minimum 28-day cube compressive strength prescribed in the Indian Standard Code IS 1343 for pre-tensioned member is \_\_\_\_\_.  
(1)  $30 \text{ N/mm}^2$  (2)  $35 \text{ N/mm}^2$  (3)  $40 \text{ N/mm}^2$  (4)  $45 \text{ N/mm}^2$

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52. At the time of initial tensioning, the maximum tensile stress,  $f_{pi}$  immediately behind the anchorage shall not exceed \_\_\_\_\_ of the ultimate tensile strength,  $f_{pu}$  of the wire or bar or strand.
- (1) 46%                      (2) 67%                      (3) 76%                      (4) 87%
- 
53. Minimum strength of concrete at transfer stage shall be \_\_\_\_\_
- (1)  $0.5 f_{ck}$                       (2)  $0.24 \sqrt{f_{ck}}$                       (3)  $0.67 f_{ck}$                       (4)  $0.7 \sqrt{f_{ck}}$
- 
54. Drying shrinkage strain develops slowly, as it \_\_\_\_\_.
- (1) develops during initial period of concreting  
(2) depends on time  
(3) develops due to prestressing of concrete  
(4) is a function of migration of water through the hardened concrete
- 
55. In the case of cables or large bars, the minimum clear spacing measured between sheathings/ducts shall not be less than the larger of \_\_\_\_\_.
- (1) 30 mm or 3 times diameter of cables.  
(2) 40 mm or maximum size of cables or bar or nominal maximum size of aggregate plus 5 mm.  
(3) 50 mm or 3 times diameter of cables or nominal maximum size of aggregate plus 5 mm.  
(4) 60 mm or 2 times diameter of cables or nominal maximum size of aggregate plus 5 mm.
- 
56. Which IS code describes detailed precautions regarding safety measures for drilling and blasting operations ?
- (1) IS 1456 – 2004                      (2) IS 481 – 1967  
(3) IS 2023 – 1985                      (4) IS 4081 – 1986
- 
57. When events of a bigger network are numbered as 10, 20, 30, 40, etc., what is the process of numbering called ?
- (1) Skip Numbering                      (2) Special Numbering  
(3) Prime Numbering                      (4) Ultimate Numbering
- 
58. What is optimistic time estimate considered in PERT analysis ?
- (1) Maximum possible time                      (2) Shortest possible time  
(3) Most likely time                      (4) None of the above

59. In Quality Control, Reliability, for sampling of units, is expressed as a percentage in the form of a Reliability number as

- (1)  $100 - \left[ \frac{\text{no. of defective units}}{\text{no. of units tested}} \times 100 \right]$
- (2)  $100 - \left[ \frac{\text{no. of units tested}}{\text{no. of defective units}} \times 100 \right]$
- (3)  $100 - \left[ \frac{\text{no. of units tested}}{\text{no. of defective units}} \times \text{standard deviation} \right]$
- (4)  $100 - [\text{no. of possible defective units}]$

60. Identify which of the following inventory control policy is classified *on the basis of consumption rate of inventory* and helps to control obsolescence ?

- (1) SDE (Scarce, Difficult and Easy)
- (2) VED (Vital, Essential and Desirable)
- (3) HML (High, Medium and Low)
- (4) FSN (Fast, Slow and Normal)

61. In construction industry, the conformance cost associated with preparing work instructions and checklist, drafting specifications, training of staff and workmen is classified as

- |                     |                    |
|---------------------|--------------------|
| (1) Prevention Cost | (2) Appraisal Cost |
| (3) Failure Cost    | (4) Inventory Cost |

62. Which among the following are the principles which belong to modern management theory suggested by Henry Fayol ?

- (i) Obtaining harmony in group action
- (ii) Replacing rules of thumb with science
- (iii) Authority and Responsibility
- (iv) Unity of command

**Answer options :**

- |                              |                              |
|------------------------------|------------------------------|
| (1) Only (i), (ii) and (iii) | (2) Only (i), (iii) and (iv) |
| (3) Only (i) and (iii)       | (4) Only (iii) and (iv)      |

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63. Which of the following statements are true for line-type organization ?

- (i) These are easier to establish.
- (ii) There is no unity of control.
- (iii) Decisions can be taken quickly.
- (iv) There is a strong sense of discipline.

**Answer options :**

- (1) All of the above
- (2) Only (i), (iii) and (iv)
- (3) Only (i), (ii) and (iv)
- (4) Only (i)

---

64. Which type of crane will you recommend for the construction of High Rise Building ?

- (1) Crawler crane
- (2) Truck mounted crane
- (3) Tower crane
- (4) Gantry crane

---

65. The occupational disease that results from the inhalation of specific dust to the construction worker is

- (1) Bursitis
- (2) Hearing impairment
- (3) Muscle disorder
- (4) Pneumoconiosis

---

66. In quality management system, the set of activities which builds confidence of both customers and managers and suggests that all quality requirements are being met is called as

- (1) Quality of concept
- (2) Design quality
- (3) Quality control
- (4) Quality assurance

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67. In solving simultaneous equations by Gauss-Jordan method, the coefficient matrix is reduced to \_\_\_\_\_ matrix.

- (1) Square (2) Diagonal  
(3) Null (4) Triangular

68. Using Gauss-Jordan method, the solution of the system of equations

$$x + y + z = 9$$

$$2x - 3y + 4z = 13$$

$$3x + 4y + 5z = 40$$

is

- (1)  $x = 3, y = 1, z = 5$  (2)  $x = 5, y = 1, z = 3$   
(3)  $x = 9, y = 1, z = \frac{13}{2}$  (4)  $x = 1, y = 3, z = 5$

69. Solve the following equations by Gauss elimination method.

$$2x + 4y - 6z = -4$$

$$x + 5y + 3z = 10$$

$$x + 3y + 2z = 5$$

- (1)  $x = -3, y = 2, z = 1$  (2)  $x = 3, y = -2, z = 1$   
(3)  $x = 3, y = 1, z = -2$  (4)  $x = 1, y = 3, z = -2$

70. Apply Gauss elimination method to solve the following equations.

$$x + 4y - z = -5$$

$$x + y - 6z = -12$$

$$3x - y - z = 4$$

- (1)  $x = 1.6479, y = -1.1408, z = 2.0845$   
(2)  $x = -2.1155, y = 0.1555, z = 1.5835$   
(3)  $x = 3.8425, y = -2.2835, z = 0.8455$   
(4)  $x = -2.2885, y = 1.4825, z = 3.7885$

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71. While solving the following simultaneous equations by iterative methods, with  $x_1 = 0$ ,  $x_2 = 0$  and  $x_3 = 0$ ,

$$20x_1 + 2x_2 + 6x_3 = 28$$

$$x_1 + 20x_2 + 9x_3 = -23$$

$$2x_1 - 7x_2 - 20x_3 = -57$$

what will be the value of  $x_1$  in next iteration ?

- (1) 1.0                      (2) 1.20                      (3) 1.33                      (4) 1.40

72. Obtain root of equation  $f(x) = \cos x - xe^x = 0$  using bisection method.

- (1) 0.515                      (2) 0.425                      (3) 0.325                      (4) 0.715

73. The root of the equation using  $x \log_{10} x = 1.2$ , using Newton-Raphson method by assuming initial approximation as 2 is

- (1) 2.513                      (2) 2.0256                      (3) 2.169                      (4) 2.741

74. Find the smallest positive root of the equation  $3x^3 - 9x^2 + 8 = 0$ , correct to 4 places of decimals using Newton-Raphson method.

- (1) 3.2568                      (2) 1.2261                      (3) 2.2361                      (4) 0.8261

75. Evaluate  $\int_0^6 \frac{dx}{1+x^2}$  by using Simpson's  $\frac{3}{8}$  rule. (Choose step size  $h = 1$ )

- (1) 1.4326                      (2) 3.1571                      (3) 4.132                      (4) 1.3571

76. The number of strips required in Simpson's  $\frac{3}{8}$  rule is a multiple of

- (1) 1                      (2) 2                      (3) 3                      (4) 6

77. Evaluate the integral  $I = \int_3^7 x^2 \cdot \log x \cdot dx$ , using Simpson's  $\frac{1}{3}$  rule with  $h = 1$ .

- (1) 277.4216                      (2) 177.4816  
(3) 127.6251                      (4) 150.6626

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78. As a part of ground work for plaster, dots are laid on the surface of wall to be plastered having size

- |                   |                   |
|-------------------|-------------------|
| (1) 10 cm × 10 cm | (2) 20 cm × 20 cm |
| (3) 10 mm × 10 mm | (4) 15 cm × 15 cm |

79. A vertical member of a frame which is employed to sub-divide a window or door vertically is called as

- |             |             |
|-------------|-------------|
| (1) Jamb    | (2) Reveal  |
| (3) Transom | (4) Mullion |

80. Following paint hardens by evaporation of thinner or solvent :

- |                     |                     |
|---------------------|---------------------|
| (1) Aluminium paint | (2) Cellulose paint |
| (3) Asbestos paint  | (4) Silicate paint  |

81. A pneumatic caisson is a structure used in foundation work, which is

- (1) Open at top as well as bottom
- (2) Open at bottom and closed at top
- (3) Closed at top as well as bottom
- (4) Closed at bottom and open at top

82. By using which materials can resilient floors be made ?

- |              |                      |
|--------------|----------------------|
| (1) PVC      | (2) Rubber           |
| (3) Linoleum | (4) All of the above |

83. In which IS code are details of slump test mentioned ?

- |                    |                    |
|--------------------|--------------------|
| (1) IS 1060 – 1968 | (2) IS 1199 – 1999 |
| (3) IS 1280 – 2000 | (4) IS 1357 – 1998 |

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84. Which defect in timber is an early sign of decay ?

- (1) Heart Shake (2) Star Shake  
(3) Ring Shake (4) Cup Shake

85. Normally what should be the height of building for which fire lifts must be provided ?

- (1) Above 15 meters (2) Above 25 meters  
(3) Above 40 meters (4) Above 50 meters

86. As per IS 456 – 2000, minimum cement content for M25 grade concrete with moderate exposure condition used in R.C.C. work is

- (1) 250 kg/m<sup>3</sup> (2) 300 kg/m<sup>3</sup> (3) 320 kg/m<sup>3</sup> (4) 340 kg/m<sup>3</sup>

87. The water seal in the traps varies from

- (1) 5 to 10 cm (2) 3.5 to 7.5 cm (3) 2.5 to 5.0 cm (4) 3.0 to 7.5 cm

88. Specific gravity of building stones should be more than

- (1) 2.7 (2) 2.9 (3) 3.0 (4) 2.5

89. If \_\_\_\_\_ constituent is in excess in brick earth it makes bricks brittle.

- (1) Alumina (2) Silica  
(3) Lime (4) Magnesia

90. When a body is subjected to the two mutually perpendicular stresses,  $\sigma_x$  &  $\sigma_y$ , then the centre of Mohr's circle from the origin is

- (1)  $\frac{\sigma_x + \sigma_y}{2}$  (2)  $\frac{\sigma_x - \sigma_y}{2}$  (3)  $\frac{2\sigma_x + \sigma_y}{2}$  (4)  $\sigma_x + \sigma_y$

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91. What will be the modulus of rigidity, if the value of modulus of elasticity is 200 KN/mm<sup>2</sup> & Poisson Ratio is 0.25 ?

- (1) 70                      (2) 80                      (3) 125                      (4) 200

92. Due to external loading, the length of member is decreased by dl. The ratio of decrease in length to original length is called

- (1) Intensity of stress                      (2) Compressive stress  
(3) Shear strain                      (4) Compressive strain

93. A simply supported beam of span 'L' m is carrying a triangular load, varying gradually from zero at supports (i.e. both ends) to W per unit length at the centre of span. What will be the maximum bending moment ?

- (1)  $\frac{WL^2}{6}$                       (2)  $\frac{WL^2}{12}$                       (3)  $\frac{3WL^2}{20}$                       (4)  $\frac{2WL^2}{9}$

94. The bending equation is written as \_\_\_\_\_.

- (1)  $\frac{I}{M} = \frac{\sigma}{Y} = \frac{E}{R}$                       (2)  $\frac{M}{I} = \frac{\sigma^2}{Y} = \frac{E^2}{R^2}$   
(3)  $\frac{M}{I} = \frac{\sigma}{Y} = \frac{E}{R}$                       (4)  $\frac{M^2}{I} = \frac{\sigma^2}{Y} = \frac{E^2}{R}$

95. If a point in a strained material is subjected to two mutually perpendicular stresses,  $\sigma_x = 100$  MPa (T) and  $\sigma_y = 50$  MPa (C), then what will be the magnitude of maximum shear stress ?

- (1) 25 MPa                      (2) 50 MPa                      (3) 75 MPa                      (4) 150 MPa

96. A bar of diameter 30 mm is subjected to a tensile load such that the measured extension on a gauge length of 200 mm is 0.09 mm and the change in diameter is 0.0045 mm. Calculate the Poisson Ratio :

- (1)  $\frac{1}{3}$                       (2)  $\frac{1}{4}$                       (3)  $\frac{1}{5}$                       (4)  $\frac{1}{6}$

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97. A point of contraflexure in a bending moment diagram indicates \_\_\_\_\_.

- (1) Negative Bending moment
- (2) Zero shear force
- (3) Bending moment changes sign
- (4) Shear force changes sign

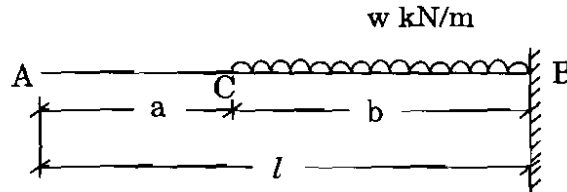
98. A simply supported beam of span  $l$  is carrying point load  $W$  at mid span. What is the deflection at centre of beam ?

- |                                     |                                      |
|-------------------------------------|--------------------------------------|
| (1) $\frac{Wl^2}{48EI}$             | (2) $\frac{Wl^3}{48EI}$              |
| (3) $\frac{5}{348} \frac{Wl^3}{EI}$ | (4) $\frac{11}{120} \frac{Wl^3}{EI}$ |

99. The section modulus of a circular section at an axis passing its CG is

- |                         |                          |                          |                          |
|-------------------------|--------------------------|--------------------------|--------------------------|
| (1) $\frac{\pi d^2}{4}$ | (2) $\frac{\pi d^2}{16}$ | (3) $\frac{\pi d^3}{16}$ | (4) $\frac{\pi d^3}{32}$ |
|-------------------------|--------------------------|--------------------------|--------------------------|

100. A cantilever beam AB of length  $l$  and subjected to a U.D.L. of intensity ' $w$ ' kN/m over a length ' $b$ ' is shown in the figure. If  $EI$  is constant, then what is the deflection at C ?



- |  |                                |
|--|--------------------------------|
| (1) $\frac{w \cdot a \cdot b^3}{6 EI}$ | (2) $\frac{w \cdot b^3}{6 EI}$ |
| (3) $\frac{w \cdot a \cdot b^3}{8 EI}$ | (4) $\frac{w \cdot b^4}{8 EI}$ |

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P.T.O.

## सूचना — (पृष्ठ 1 वरून पुढे.....)

- (8) प्रश्नपुस्तिकेमध्ये विहित केलेल्या विशिष्ट जागीच कच्चे काम (रफ वर्क) करावे. प्रश्नपुस्तिकेव्यतिरिक्त उत्तरपत्रिकेवर वा इतर कागदावर कच्चे काम केल्यास ते कॉपी करण्याच्या उद्देशाने केले आहे, असे मानले जाईल व त्यानुसार उमेदवारावर शासनाने जारी केलेल्या “परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचे अधिनियम-82” यातील तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एक वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.
- (9) सदर प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपल्यानंतर उमेदवाराला ही प्रश्नपुस्तिका स्वतःबरोबर परीक्षाकक्षाबाहेर घेऊन जाण्यास परवानगी आहे. मात्र परीक्षाकक्षाबाहेर जाण्यापूर्वी उमेदवाराने आपल्या उत्तरपत्रिकेचा भाग-1 समवेक्षकाकडे न विसरता परत करणे आवश्यक आहे.

## नमुना प्रश्न

Pick out the correct word to fill in the the blank :

**Q.No. 201.** I congratulate you \_\_\_\_\_ your grand success.

- (1) for (2) at  
(3) on (4) about

ह्या प्रश्नाचे योग्य उत्तर “(3) on” असे आहे. त्यामुळे या प्रश्नाचे उत्तर “(3)” होईल. यास्तव खालीलप्रमाणे प्रश्न क्र. 201 समोरील उत्तर-क्रमांक “(3)” हे वर्तुळ पूर्णपणे छायांकित करून दाखविणे आवश्यक आहे.

प्र. क्र. 201. (1) (2) (3) (4)

अशा पद्धतीने प्रस्तुत प्रश्नपुस्तिकेतील प्रत्येक प्रश्नाचा तुमचा उत्तर-क्रमांक हा तुम्हाला स्वतंत्ररीत्या पुरविलेल्या उत्तरपत्रिकेवरील त्या त्या प्रश्नक्रमांकासमोरील संबंधित वर्तुळ पूर्णपणे छायांकित करून दाखवावा. ह्याकरिता फक्त काळ्या शाईचे बॉलपेन वापरावे, पेन्सिल वा शाईचे पेन वापरू नये.

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

विषय : - स्थापत्य अभियांत्रिकी पेपर क्र. १

महाराष्ट्र लोकसेवा आयोगामार्फत दिनांक १८ डिसेंबर, २०२१ रोजी आयोजित "महाराष्ट्र स्थापत्य अभियांत्रिकी सेवा (मुख्य) परीक्षा २०२०" (स्थापत्य अभियांत्रिकी पेपर क्र.१) या परीक्षेची उत्तरतालिका उमेदवारांच्या माहितीसाठी आयोगाच्या संकेतस्थळावर प्रसिध्द करण्यात आली होती. त्यासंदर्भात उमेदवारांनी अधिप्रमाणित (Authentic) स्पष्टीकरण देऊन ऑनलाईन पध्दतीने सादर केलेल्या हरकती, तसेच तज्ज्ञांचे अभिप्राय विचारात घेऊन, आयोगाने उत्तरतालिका सुधारित केली आहे. या उत्तरतालिकेतील उत्तरे अंतिम समजण्यात येतील. यासंदर्भात आलेली निवेदने विचारात घेतली जाणार नाहीत व त्याबाबत कोणताही पत्रव्यवहार केला जाणार नाही, याची कृपया नोंद घ्यावी.

## उत्तरतालिका - KEY

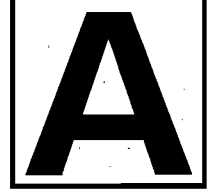
प्रश्न क्रमांक	उत्तरे			
	संच A	संच B	संच C	संच D
1	3	4	1	2
2	3	3	1	4
3	1	3	3	1
4	3	3	1	1
5	3	3	4	4
6	2	4	#	1
7	4	4	3	4
8	1	4	3	2
9	2	4	1	4
10	3	4	#	3
11	3	4	2	#
12	3	1	4	4
13	2	3	1	4
14	4	4	2	2
15	4	2	1	2
16	1	4	4	4
17	2	4	1	#
18	4	3	4	2
19	3	1	2	1
20	4	3	3	2
21	3	1	4	2
22	1	4	4	1
23	4	1	2	2
24	3	1	4	1
25	3	3	1	2

प्रश्न क्रमांक	उत्तरे			
	संच A	संच B	संच C	संच D
26	3	1	1	4
27	3	4	4	2
28	4	#	1	3
29	4	3	4	3
30	4	3	2	1
31	4	1	4	3
32	4	#	3	2
33	4	2	#	4
34	1	4	4	4
35	3	1	4	3
36	4	2	2	3
37	2	1	2	1
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45	1	2	2	3
46	1	4	1	3
47	3	1	2	2
48	1	1	4	4
49	4	4	2	4
50	#	1	3	1

प्रश्न क्रमांक	उत्तरे			
	संच A	संच B	संच C	संच D
51	3	4	3	2
52	3	2	1	4
53	1	4	3	3
54	#	3	2	4
55	2	#	4	3
56	4	4	4	1
57	1	4	3	4
58	2	2	3	3
59	1	2	1	3
60	4	4	3	3
61	1	#	3	3
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63	2	1	4	4
64	3	2	1	4
65	4	2	2	4
66	4	1	3	4
67	2	2	3	4
68	4	1	3	1
69	1	2	2	3
70	1	4	4	4
71	4	2	4	2
72	1	3	1	4
73	4	3	2	4
74	2	1	4	3
75	4	3	3	1

प्रश्न क्रमांक	उत्तरे			
	संच A	संच B	संच C	संच D
76	3	2	4	3
77	#	4	3	1
78	4	4	1	4
79	4	3	4	1
80	2	3	3	1
81	2	1	3	3
82	4	3	3	1
83	#	3	3	4
84	2	2	4	#
85	1	4	4	3
86	2	1	4	3
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96	1	4	3	4
97	3	3	1	2
98	2	4	3	3
99	4	3	1	4
100	4	1	4	4

# ने दर्शविलेले प्रश्न रद्द करण्यात आलेले आहेत.



### सूचना

- (1) सदर प्रश्नपुस्तिकेत 100 अनिवार्य प्रश्न आहेत. उमेदवारांनी प्रश्नांची उत्तरे लिहिण्यास सुरुवात करण्यापूर्वी या प्रश्नपुस्तिकेत सर्व प्रश्न आहेत किंवा नाहीत याची खात्री करून घ्यावी. तसेच अन्य काही दोष आढळल्यास ही प्रश्नपुस्तिका समवेक्षकांकडून लगेच बदलून घ्यावी.
- (2) आपला परीक्षा-क्रमांक ह्या चौकोनांत न विसरता बॉलपेनने लिहावा.  

परीक्षा-क्रमांक									

केंद्राची संकेताक्षरे शेवटचा अंक
- (3) वर छापलेला प्रश्नपुस्तिका क्रमांक तुमच्या उत्तरपत्रिकेवर विशिष्ट जागी उत्तरपत्रिकेवरील सूचनेप्रमाणे न विसरता नमूद करावा.
- (4) या प्रश्नपुस्तिकेतील प्रत्येक प्रश्नाला 4 पर्यायी उत्तरे सुचविली असून त्यांना 1, 2, 3 आणि 4 असे क्रमांक दिलेले आहेत. त्या चार उत्तरांपैकी सर्वात योग्य उत्तराचा क्रमांक उत्तरपत्रिकेवरील सूचनेप्रमाणे तुमच्या उत्तरपत्रिकेवर नमूद करावा. अशा प्रकारे उत्तरपत्रिकेवर उत्तरक्रमांक नमूद करताना तो संबंधित प्रश्नक्रमांकासमोर छायांकित करून दर्शविला जाईल याची काळजी घ्यावी. ह्याकरिता फक्त काळ्या शाईचे बॉलपेन वापरावे, पेन्सिल वा शाईचे पेन वापरू नये.
- (5) सर्व प्रश्नांना समान गुण आहेत. यास्तव सर्व प्रश्नांची उत्तरे द्यावीत. घाईमुळे चुका होणार नाहीत याची दक्षता घेऊनच शक्य तितक्या वेगाने प्रश्न सोडवावेत. क्रमाने प्रश्न सोडविणे श्रेयस्कर आहे पण एखादा प्रश्न कठीण वाटल्यास त्यावर वेळ न घालविता पुढील प्रश्नाकडे वळावे. अशा प्रकारे शेवटच्या प्रश्नापर्यंत पोहोचल्यानंतर वेळ शिल्लक राहिल्यास कठीण म्हणून वगळलेल्या प्रश्नांकडे परतणे सोईस्कर ठरेल.
- (6) उत्तरपत्रिकेत एकदा नमूद केलेले उत्तर खोडता येणार नाही. नमूद केलेले उत्तर खोडून नव्याने उत्तर दिल्यास ते तपासले जाणार नाही. एकापेक्षा जास्त उत्तरे नमूद केल्यास ते उत्तर चुकीचे धरले जाईल व त्या चुकीच्या उत्तराचे गुण वजा केले जातील.
- (7) प्रस्तुत परीक्षेच्या उत्तरपत्रिकांचे मूल्यांकन करताना उमेदवारांच्या उत्तरपत्रिकेतील योग्य उत्तरांनाच गुण दिले जातील. तसेच "उमेदवाराने वस्तुनिष्ठ बहुपर्यायी स्वरूपाच्या प्रश्नांची दिलेल्या चार उत्तरांपैकी सर्वात योग्य उत्तरेच उत्तरपत्रिकेत नमूद करावीत. अन्यथा त्यांच्या उत्तरपत्रिकेत सोडविलेल्या प्रत्येक चुकीच्या उत्तरांसाठी 25% किंवा 1/4 गुण वजा करण्यात येतील".

### ताकीद

ह्या प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपेपर्यंत ही प्रश्नपुस्तिका आयोगाची मालमत्ता असून ती परीक्षाकक्षात उमेदवाराला परीक्षेसाठी वापरण्यास देण्यात येत आहे. ही वेळ संपेपर्यंत सदर प्रश्नपुस्तिकेची प्रत/प्रती, किंवा सदर प्रश्नपुस्तिकेतील काही आशय कोणत्याही स्वरूपात प्रत्यक्ष वा अप्रत्यक्षपणे कोणत्याही व्यक्तीस पुरविणे, तसेच प्रसिद्ध करणे हा गुन्हा असून अशी कृती करणाऱ्या व्यक्तीवर शासनाने जारी केलेल्या "परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचा अधिनियम-82" यातील तरतुदीनुसार तसेच प्रचलित कायद्याच्या तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एक वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.

तसेच ह्या प्रश्नपत्रिकेसाठी विहित केलेली वेळ संपण्याआधी ही प्रश्नपुस्तिका अनधिकृतपणे बाळगणे हा सुद्धा गुन्हा असून तसे करणारी व्यक्ती आयोगाच्या कर्मचारीवृंदापैकी, तसेच परीक्षेच्या पर्यवेक्षकीयवृंदापैकी असली तरीही अशा व्यक्तीविरुद्ध उक्त अधिनियमानुसार कारवाई करण्यात येईल व दोषी व्यक्ती शिक्षेस पात्र होईल.

पुढील सूचना प्रश्नपुस्तिकेच्या अंतिम पृष्ठावर पहा

पर्यवेक्षकांच्या सूचनेविना हे सील उघडू नये



कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

1. The thickness of diffuse double layer in pure clay will be maximum for the following predominant clay mineral :

- (1) Kaolinite (2) Montmorillonite  
(3) Illite (4) Muscovite

2. For a soil having  $\gamma_{\text{sat}} = 22 \text{ kN/m}^3$ , how much will  $\gamma_{\text{sub}}$  be ? (Take  $\gamma_w = 10 \text{ kN/m}^3$ )

- (1)  $21 \text{ kN/m}^3$  (2)  $12 \text{ kN/m}^3$   
(3)  $22 \text{ kN/m}^3$  (4) None of the above

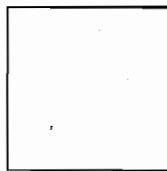
3. If 's' is the shear strength, 'c' and ' $\phi$ ' are shear strength parameters and ' $\sigma_n$ ' is the normal stress at failure, then Coulomb's equation for shear strength of the soil can be represented by \_\_\_\_\_.

- (1)  $c = s + \sigma_n \tan \phi$  (2)  $c = s - \sigma_n \tan \phi$   
(3)  $s = \sigma_n + c \tan \phi$  (4)  $s = c - \sigma_n \tan \phi$

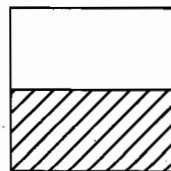
4. A clay sample has a void ratio 0.54 in dry state. The specific gravity of soil solids is 2.7. What is the shrinkage limit of the soil ?

- (1) 8.5% (2) 10.0% (3) 17.0% (4) 20.0%

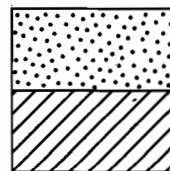
5. The given figure indicates the weights of different pycnometers.



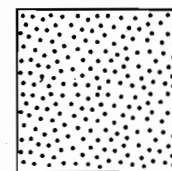
Empty  
Pycnometer  
( $W_1$ )



Pycnometer  
+  
Dry Soil  
( $W_2$ )



Pycnometer  
+  
Soil  
+  
Water  
( $W_3$ )



Pycnometer  
+  
Water  
( $W_4$ )

For this, the specific gravity of the solids is given by

- (1)  $\frac{W_2}{W_4 - W_2}$  (2)  $\frac{W_1 - W_2}{(W_3 - W_4) - (W_2 - W_1)}$   
(3)  $\frac{W_2}{W_3 - W_4}$  (4)  $\frac{W_2 - W_1}{(W_2 - W_1) - (W_3 - W_4)}$

6. A soil sample having specific gravity of 2.5 has OMC of 20%. Find out the theoretical maximum dry density assuming density of water as 1.0 gm/cc. Choose the correct answer from the following (in gm/cc) :

(1)  $\frac{5}{3}$                       (2)  $\frac{7}{4}$                       (3)  $\frac{8}{5}$                       (4) 1.5

7. A cohesive soil was tested in natural state and in remoulded state. If the cohesion of soil in natural state is 40 kN/m<sup>2</sup> and in remoulded state is 20 kN/m<sup>2</sup>, then the sensitivity of the cohesive soil is \_\_\_\_\_.

(1) 0.5                      (2) 1.0                      (3) 2.0                      (4) 3.0

8. An excavation is to be made in purely cohesive soil deposit having  $c = 20$  kN/m<sup>2</sup> and unit weight = 16 kN/m<sup>3</sup>. The depth to which the vertical sides of the excavation will remain stable without side supports will be :

(1) 1.25 m                      (2) 2.50 m                      (3) 5.00 m                      (4) 8.00 m

9. Behind a 6 m high retaining wall with vertical back, cohesionless backfill with angle of internal friction = 30° and dry unit weight = 15 kN/m<sup>3</sup> is in existence. The total force exerted on the wall per meter length of the wall in active and passive condition will be respectively :

(1) 90 and 810 kN                      (2) 810 and 90 kN  
(3) 180 and 450 kN                      (4) 180 and 1620 kN

10. In a two-dimensional flow,  $u = cx$  and  $v = -cy$  where  $c = a$  constant. The streamlines are expressed by the equation :

(1)  $\frac{x}{y} = \text{constant}$                       (2)  $xy = \text{constant}$   
(3)  $x + y = \text{constant}$                       (4)  $x - y = \text{constant}$

11. The following results are obtained on shear stress ( $\tau$ ) and rate of deformation  $\left(\frac{du}{dy}\right)$  at constant temperature for a fluid.

$\left(\frac{du}{dy}\right)$ (radians/sec)	0	0	1	2	3
$\tau$ (kPa)	0	10	20	30	40

The above fluid is classified as

(1) Newtonian                      (2) Non-Newtonian  
(3) Ideal plastic                      (4) Thixotropic

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12. Which of the following combination of pressure ( $\Delta P$ ), density ( $\rho$ ), length ( $l$ ), and discharge ( $Q$ ) results into dimension  $M^0L^2T^{-2}$  ?

(1)  $\sqrt{\frac{\rho}{\Delta P}} \cdot \frac{Q}{l^2}$  (2)  $\frac{\Delta P l Q}{\rho}$

(3)  $\frac{\rho l}{\Delta P Q^2}$  (4)  $\sqrt{\frac{\Delta P}{\rho}} \cdot \frac{Q}{l^2}$

13. Consider the following statements As the pipe ages :

- (i) The friction factor increases non-linearly with time.  
 (ii) The pipe becomes smoother with time.  
 (iii) The absolute roughness increases linearly with time.

Which of the above statements are correct ?

**Answer options :**

- (1) (i) and (ii) (2) (ii) and (iii)  
 (3) (i) and (iii) (4) (i), (ii) and (iii)

14. The velocity distribution in the boundary layer is given by  $\frac{u}{U} = \left(\frac{y}{\delta}\right)^{1/7}$

$$\left[ \begin{array}{l} u = \text{point velocity at distance } y \\ U = \text{free stream velocity} \\ \delta = \text{nominal thickness} \end{array} \right]$$

What would be the displacement thickness ( $\delta^*$ ) ?

- (1)  $\frac{\delta}{5}$   
 (2)  $\frac{\delta}{6}$   
 (3)  $\frac{\delta}{7}$   
 (4)  $\frac{\delta}{8}$

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15. A sudden closure of a valve at the downstream end of a pipe leading from a reservoir will cause water hammer. The length of this pipe is 'L' and speed of the pressure wave is 'a'. If time of closure of valve is 't<sub>c</sub>', then valve closure is said to be rapid only when :

(1)  $\frac{L}{2a} \geq t_c$       (2)  $\frac{L}{a} \geq t_c$       (3)  $\frac{2L}{a} = t_c$       (4)  $\frac{2L}{a} \geq t_c$

16. Consider the following statements :

Pressure coefficient is the ratio of

(i) Pressure to dynamic pressure and is expressed as  $\frac{\Delta P}{\left(\frac{\rho_w V^2}{2}\right)}$

(ii) Dynamic pressure to pressure and is expressed as  $\frac{\left(\frac{\rho_w V^2}{2}\right)}{\Delta P}$

(iii) Pressure to dynamic pressure and is expressed as  $\frac{\Delta P}{\gamma_w H}$

(iv) Dynamic pressure to pressure and is expressed as  $\frac{\gamma_w H}{\Delta P}$

Which of the above statements are correct ?

**Answer options :**

(1) (i) and (iii)      (2) (ii) and (iv)      (3) Only (i)      (4) Only (iii)

17. When a ship enters a sea from a river, one can expect it to :

- (1) rise a little  
 (2) sink a little  
 (3) remain at the same level of draft  
 (4) rise or fall depending on whether it is of wood or steel

18. The valve closure is said to be gradual if the time required to close the valve is :

(1)  $t = \frac{2L}{c}$       (2)  $t \leq \frac{2L}{c}$       (3)  $t < \frac{4L}{c}$       (4)  $t > \frac{2L}{c}$

Where L = length of pipe, c = velocity of pressure wave

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19. In all reaction turbines, the maximum efficiency is obtained, if  
[Note : All the angles mentioned below are measured with respect to the direction of the peripheral velocity]  
(1) the guide vane angle is  $90^\circ$   
(2) the blade angle of the runners is  $90^\circ$  at the inlet  
(3) the blade angle of the runners is  $90^\circ$  at the outlet  
(4) the angle of the absolute velocity vector at the outlet is  $90^\circ$
- 
20. The cavitation damage in turbine runner occurs :  
(1) near the inlet on the concave side of blades  
(2) near the outlet on the convex side of blades  
(3) near the inlet on the convex side of blades  
(4) near the outlet on the concave side of blades
- 
21. In a centrifugal pump, the manometric head is (assuming the diameters of suction and delivery pipes to be the same) :  
(1) the difference in elevation between the water surface in the high level reservoir and the water level in the sump  
(2) the height to which water is lifted by the pump measured above the pump centre line  
(3) the difference in the piezometric heads between the points on the delivery and suction pipes as close to the pump as possible  
(4) the head developed by the pump
- 
22. If two pumps, identical in all respects and each capable of delivering a discharge 'Q' against a head 'H', are connected :  
(1) in parallel, the resulting discharge is Q against a head of 2H.  
(2) in series, the resulting discharge is 2Q against a head of 2H.  
(3) in series, the resulting discharge is 2Q against a head of H.  
(4) in parallel, the resulting discharge is 2Q against a head of H.
- 
23. The inward flow reaction turbine having radial discharge at outlet is known as :  
(1) Francis turbine  
(2) Pelton turbine  
(3) Axial flow reaction turbine  
(4) None of the above

24. A single acting reciprocating pump has the plunger diameter of 20 cm and stroke of 30 cm. The pump discharges  $0.53 \text{ m}^3$  of water per minute at 60 rpm. Find the theoretical discharge.

- (1)  $0.00742 \text{ m}^3/\text{sec}$  (2)  $0.00142 \text{ m}^3/\text{sec}$   
 (3)  $0.00842 \text{ m}^3/\text{sec}$  (4)  $0.00942 \text{ m}^3/\text{sec}$

25. Match List I with List II :

<i>List I</i>	<i>List II</i>
A. Francis turbine	I. Axial flow
B. Pelton wheel turbine	II. Outward radial flow
C. Kaplan turbine	III. Mixed radial and axial flow
D. Fourneyron turbine	IV. Tangential flow

**Answer options :**

- (1) A-II, B-I, C-III, D-IV (2) A-III, B-IV, C-I, D-II  
 (3) A-III, B-I, C-II, D-IV (4) A-III, B-II, C-I, D-IV

26. When Pelton wheel turbine was tested, the head at the base of the nozzle was 50 m and discharge of the nozzle was  $0.1 \text{ m}^3/\text{s}$ . Then the power at the base of the nozzle should be :

- (1) 49.05 kW (2) 490.5 kW (3) 4905 kW (4) 5 kW

27. A run-off river hydroelectric power station is proposed across a river at a site where a net head is 30 m, discharge is  $40 \text{ m}^3/\text{s}$  and efficiency is 60%. Calculate the electric energy generated by the plant.

- (1) 7163.2 kW (2) 7063.2 kW (3) 7263.2 kW (4) 7363.2 kW

28. Identify the **incorrect** statement pertaining to evaporation.

- (1) Evaporation is a cooling process  
 (2) Other factors remaining same, an increase in pressure increases evaporation  
 (3) When a solute is dissolved in water, there is a reduction in the rate of evaporation  
 (4) Seasonal evaporation rates depend upon the size of the water bodies

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29. The Probable Maximum Precipitation (PMP) at a station or a basin is the :
- (1) rainfall of a given duration that can occur with a return period of 1000 years
  - (2) greatest rainfall for a given duration that is physically possible
  - (3) rainfall of given duration that has the maximum probability of occurrence
  - (4) an impossibly large rainfall of given duration
- 
30. In a flow-mass curve study, the demand line drawn from a ridge in the curve did not intersect the mass curve again. This represents that :
- (1) the reservoir was not full at the beginning
  - (2) the storage was not adequate
  - (3) the demand cannot be met by the inflow as the reservoir will not refill
  - (4) the reservoir is wasting water by spill
- 
31. Due to the deposition of sediments by the inflowing water in a storage reservoir :
- (1) only the dead storage capacity decreases with time
  - (2) only the live storage capacity decreases with time
  - (3) both the dead storage and live storage capacities decrease with time
  - (4) the total storage volume remains constant due to increase in valley storage
- 
32. Which of the following pairs of terms used in ground water hydrology are *not* synonymous ?
- (1) Permeability and hydraulic conductivity
  - (2) Storage coefficient and storativity
  - (3) Actual velocity of flow and discharge velocity
  - (4) Water table aquifer and unconfined aquifer
- 
33. Rain gauge station 'X' did not function for a part of month during which a storm occurred. The storm produced rainfall of 84, 70 and 96 mm at three surrounding stations A, B and C respectively. The normal annual rainfall at the stations X, A, B and C are respectively 770, 770, 770 and 770 mm. Estimate the missing storm rainfall at station 'X'.
- (1) 83.33 mm
  - (2) 82.33 mm
  - (3) 84.33 mm
  - (4) 81.33 mm

34. If the total runoff is  $1600 \text{ m}^3/\text{sec}$ , drainage basin area is  $104 \text{ km}^2$ , time interval is 2 hours, then the depth of direct runoff is : (d = direct run off depth)
- (1) 12.07 cm      (2) 11.07 cm      (3) 13.07 cm      (4) 14.07 cm
- 
35. The surface joining the static water levels in several wells penetrating a confined aquifer represents
- (1) water table surface      (2) capillary fringe  
(3) piezometric surface of the aquifer      (4) cone of depression
- 
36. A triangular DRH due to a storm has a time base of 80 hrs and a peak flow of  $50 \text{ m}^3/\text{s}$  occurring at 20 hrs from the start. If the catchment area is  $144 \text{ km}^2$ , the rainfall excess in the storm was :
- (1) 20 cm      (2) 7.2 cm  
(3) 5.0 cm      (4) None of the above
- 
37. \_\_\_\_\_ is best suited for situations where the canal bed level is lower than the drainage and also discharge of canal is smaller than the drainage.
- (1) Aqueduct      (2) Syphon aqueduct  
(3) Canal syphon      (4) Super passage
- 
38. \_\_\_\_\_ are placed within the basin, across the basin floor, which help in breaking the flow and dissipate energy mostly by impact.
- (1) Chute blocks      (2) Sills  
(3) Dentated sills      (4) Baffle piers
- 
39. Provision of drainage filters in an earthen dam reduce the \_\_\_\_\_ in the downstream portion of the dam.
- (1) Earth pressure      (2) Seepage  
(3) Permeability      (4) Pore pressure
- 
40. Trap efficiency of a reservoir is a function of :
- (1) Capacity/inflow ratio      (2) Capacity/outflow ratio  
(3) Outflow/inflow ratio      (4) None of the above

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41. The main function of a \_\_\_\_\_ is to regulate the supplies entering the off-take channels.

- (1) Head regulator (2) Cross regulator  
(3) Canal escape (4) Canal outlet

42. Match the pairs :

<i>Method</i>	<i>Purpose</i>
A. Khosla method	I. Design of canal
B. Kennedy's method	II. Seepage analysis
C. Laplace equation	III. Design of hydraulic jump type stilling basin
D. IS : 4997-1968	IV. Design of wiers

**Answer options :**

- (1) A-III, B-I, C-II, D-IV (2) A-III, B-II, C-I, D-IV  
(3) A-IV, B-I, C-II, D-III (4) A-IV, B-III, C-II, D-I

43. If D is the depth of scour below original bed, then the width of launching apron is generally taken as

- (1) 1.2 D (2) 1.5 D (3) 2.0 D (4) 2.5 D

44. Match the pairs for suitability of water for irrigation :

A. Low salinity water	I. Suitable for high salt tolerant plant
B. Medium sodium water	II. Unsuitable for irrigation
C. High salinity water	III. Unsuitable for fine textured soil
D. Very high sodium water	IV. All crops and all soils

**Answer options :**

- (1) A-IV, B-III, C-I, D-II (2) A-I, B-IV, C-III, D-II  
(3) A-IV, B-I, C-III, D-II (4) A-IV, B-II, C-III, D-I

45. If the jump height curve and tail water curve coincide, then the best protective measure will be \_\_\_\_\_.

- (1) Providing cistern depressed below bed with sloping glacis upstream  
(2) Simple horizontal apron  
(3) Providing sharply upturned bucket  
(4) Providing low secondary dam

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46. Consider the following statements about grade compensation :

- (i) Grade compensation is given up to maximum value of  $'75/R'$ , where R is the radius of circular curve in metres.
- (ii) According to Indian Roads Congress, grade compensation is not necessary for gradients flatter than 4 percent.

Which of the above statement/s is/are correct ?

**Answer options :**

- |                       |                          |
|-----------------------|--------------------------|
| (1) Only (i)          | (2) Only (ii)            |
| (3) Both (i) and (ii) | (4) Neither (i) nor (ii) |

---

47. 'Spot speed study' is useful in which of the (following) aspect/s of traffic engineering ?

- (1) To study the traffic capacity
- (2) To decide the speed trends
- (3) To use in accident studies
- (4) All of the above

---

48. As per Indian Roads Congress, the maximum width of a vehicle is standardised as \_\_\_\_\_.

- |              |                |                |              |
|--------------|----------------|----------------|--------------|
| (1) 3 metres | (2) 2.5 metres | (3) 3.5 metres | (4) 4 metres |
|--------------|----------------|----------------|--------------|

---

49. Which one of the following methods is used to design rigid pavement construction ?

- (1) Westergaard's method
- (2) Group Index method
- (3) CBR method
- (4) McLeod's method

---

50. The maximum value of exceptional gradient recommended by IRC for steep terrain having elevation more than 3000 m above the mean sea level is \_\_\_\_\_.

- |          |          |          |          |
|----------|----------|----------|----------|
| (1) 6.0% | (2) 6.7% | (3) 7.0% | (4) 8.0% |
|----------|----------|----------|----------|

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51. Match List I (Type of plan) with List II (Details collected during fact finding surveys are shown) and select the correct answer using the codes given below the lists.

<i>List I</i>	<i>List II</i>
A. Plan I	I. Location of places with their respective quantities of productivity
B. Plan II	II. General area plan
C. Plan III	III. Distribution of population groups
D. Plan IV	IV. Existing road networks with traffic flow and desire line diagram

**Answer options :**

- |                            |                            |
|----------------------------|----------------------------|
| (1) A-III, B-II, C-I, D-IV | (2) A-II, B-III, C-I, D-IV |
| (3) A-IV, B-II, C-III, D-I | (4) A-I, B-II, C-III, D-IV |

52. If stopping sight distance for two-way traffic on a two-lane road is 60 m, then for two-way traffic on a single lane will be
- (1) 30 m                      (2) 60 m                      (3) 90 m                      (4) 120 m

53. For a particular highway, safe non-passing sight distance is 89 m and overtaking sight distance is 289 m. What is the intermediate sight distance ?
- (1) 200 m                      (2) 187 m                      (3) 178 m                      (4) 289 m

54. As per MORTH specifications, the minimum Marshall stability value of specimen prepared for Bituminous Concrete (BC) shall be \_\_\_\_\_.
- (1) 1050 kg                      (2) 900 kg                      (3) 1000 kg                      (4) 950 kg

55. Consider the following statements about strengthening of bridges :
- (i) During inspection of existing bridges accurate measurement of the size and location of each type of deterioration is required.
- (ii) Such measurement helps in selection of method of strengthening and working out quantities involved in repair.

Which of the above statement/s is/are correct ?

**Answer options :**

- |                       |                          |
|-----------------------|--------------------------|
| (1) Only (i)          | (2) Only (ii)            |
| (3) Both (i) and (ii) | (4) Neither (i) nor (ii) |

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56. For an IRC Class AA loading train, the nose to tail spacing between successive tracked vehicles shall not be less than \_\_\_\_\_.

- (1) 18.4 m                      (2) 22.4 m                      (3) 60 m                      (4) 90 m
- 

57. Which of the following bridge types is most suitable for a span more than 800 metres ?

- (1) Cable stayed bridge                      (2) Suspension bridge  
(3) Arch bridge                      (4) None of the above
- 

58. While designing highway bridges, when the wind velocity at deck level exceeds \_\_\_\_\_ km per hour, no live load needs to be considered to be acting on the bridge.

- (1) 100                      (2) 115                      (3) 130                      (4) 145
- 

59. The hollow girder bridges are economical for spans between \_\_\_\_\_.

- (1) 5 m to 10 m                      (2) 10 m to 15 m  
(3) 15 m to 17 m                      (4) 25 m to 30 m
- 

60. Consider the following statements with respect to determination of design discharge.

*Statement I :* Design discharge may be taken as the maximum value obtained from at least two of the methods of determining the discharge viz. Empirical, Rational and/or Area-Velocity method.

*Statement II :* If the value so obtained exceeds the next high value by more than 50%, then the maximum design discharge is limited to 2.5 times the lower estimates.

Select the correct answer from the following :

**Answer options :**

- (1) Both statements I and II are true  
(2) Statement I is false and statement II is true  
(3) Statement I is true and statement II is false  
(4) Both statements I and II are false
- 

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61. Consider the following statements about the characteristics of an ideal site for bridge location across a river :

- (i) There should be straight reach of the stream.
- (ii) The flow of water at the bridge site should be in steady regime condition with whirls and cross currents.
- (iii) There should be no confluence of large tributaries at bridge site.
- (iv) Sufficiently wide stream with firm banks.

Which of the statements given above is/are correct ?

**Answer options :**

- (1) Only (i).
- (2) (i) and (iii) only
- (3) (ii) and (iv) only
- (4) (i), (iii) and (iv)

62. The most reliable method based on hydraulic characteristics of a stream, among the methods for determining the flood discharge is \_\_\_\_\_.

- (1) Unit hydrograph method
- (2) Area-velocity method
- (3) Estimation from empirical formulae
- (4) Estimation from flood marks

63. Which from the following is/are the movable bridge/s ?

- (1) Bascule bridge
- (2) Swinging bridge
- (3) Lift bridge
- (4) All of the above

64. Match the following :

*List-1*

*Shape of tunnel*

- A. Circular section
- B. Horse shoe section
- C. Egg-shaped section
- D. Segmental section

*List-2*

*Common use*

- I. Subway
- II. Carrying water
- III. Traffic purpose
- IV. Carrying sewage

**Answer options :**

- (1) A-IV, B-III, C-II, D-I
- (2) A-I, B-II, C-III, D-IV
- (3) A-II, B-III, C-IV, D-I
- (4) A-II, B-III, C-I, D-IV

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65. Consider the following statements with reference to adoption of circular cross-section for tunnels driven by shield method :

- (i) The circular cross-section provides maximum cross-sectional area with the minimum perimeter.
- (ii) Circular cross-section does not afford protection to the primary lining.
- (iii) Circular cross-section offers the least resistance to the easy rotation of shield.
- (iv) Circular cross-section is not ideally suitable for resisting the semi fluid pressure.

Which of the above statements are *incorrect* ?

**Answer options :**

- (1) (i) and (iii)
- (2) (ii) and (iv)
- (3) (i) and (ii)
- (4) (i), (iii) and (iv)

---

66. Which of the following is *not* a method of tunnelling in rocks ?

- (1) Liner plate method
- (2) Heading and Bench method
- (3) Cantilever car dump method
- (4) Drift method

---

67. Consider the following statements about the choice of tunnelling method in soft strata ?

- (i) It depends on nature and type of soil.
- (ii) It is independent of size of tunnel.
- (iii) It depends on availability of equipment.

Which of the above statement/s is/are correct ?

**Answer options :**

- (1) Only (i)
- (2) (i) and (iii) only
- (3) (ii) and (iii) only
- (4) (i), (ii) and (iii)

---

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68. Consider the following statements with respect to various methods of tunnelling :

- (i) Drift method is extremely costly and is generally recommended for ground conditions which are difficult to solve.
- (ii) Heading and bench method involves the driving of top portion in advance of the bottom portion
- (iii) Full face method is suitable for tunnels of small cross-sectional areas through stable rock.

Which of the statements is/are correct ?

**Answer options :**

- (1) (i) and (iii)
- (2) (i), (ii) and (iii)
- (3) (ii) and (iii)
- (4) (i) and (ii)

---

69. Which of the following statements is/are *incorrect* ?

- (i) Normally shafts are laid in horizontal direction only
- (ii) Usually 90 cm high wall round the edge of the shaft opening is constructed
- (iii) The ideal site for the shaft would be a valley
- (iv) During sinking of shaft in soft soils, deflection of sheets should be prevented

**Answer options :**

- (1) Only (i)
- (2) Only (ii) and (iii)
- (3) Only (ii), (iii) and (iv)
- (4) All of the above

---

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70. In which of the following type of soft strata, is the 'compressed air tunnelling' the most suitable method ?

- (1) Gravel
- (2) Silt
- (3) Clay
- (4) Sand

---

71. Which one of the following methods of tunnelling is suitable for water bearing soils ?

- (1) Full face method
- (2) Compressed air method
- (3) Heading and bench method
- (4) Drift method

---

72. Which of the following statements is/are *incorrect* while driving tunnels through soft soil ?

- (i) The use of explosives is not required.
- (ii) The progress of work is very fast.
- (iii) For excavations of materials, heavy and costly equipment are required.
- (iv) It requires support to the section which is excavated.

**Answer options :**

- (1) Only (i)
- (2) (ii) and (iii)
- (3) (i), (ii) and (iii)
- (4) All of the above

---

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73. The water supply to a house begins with the connection of the service pipe with the municipal water mains. The connection comprises of :

- (i) Stop-cock
- (ii) Goose neck
- (iii) Ferrule
- (iv) Water meter

The correct sequence of these connections is :

**Answer options :**

- (1) (i), (ii), (iii), (iv)
- (2) (iii), (i), (ii), (iv)
- (3) (iii), (ii), (i), (iv)
- (4) (i), (ii), (iv), (iii)

---

74. Generally, a dose of 2 to 3 ppm beyond break point is adopted in case of

- (1) Super chlorination
- (2) Double chlorination
- (3) Pre-chlorination
- (4) Post-chlorination

---

75. Sewer is running half full. When Manning's coefficient is increased from 0.011 to 0.022, the slope of sewer to carry the same flow at the same velocity running half full will be

- (1) increased by 2 times
- (2) decreased by 2 times
- (3) increased by 4 times
- (4) decreased by 4 times

---

76. Which of the following pairs is **not** correctly matched?

- (1) BOD<sub>5</sub> – Temperature dependent
- (2) Ultimate BOD – Independent of temperature
- (3) COD – Total organic matter
- (4) BOD<sub>5</sub>/COD – Greater than one

---

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77. The composition of clean dry air (major gases) at ground level is

- |  |  |
|--|--|
| (1) Nitrogen = 78.09% by volume<br>Oxygen = 20.95% by volume | (2) Nitrogen = 50% by volume<br>Oxygen = 40% by volume |
| (3) Nitrogen = 70% by volume<br>Oxygen = 10% by volume       | (4) Nitrogen = 21% by volume<br>Oxygen = 78% by volume |

78. Bacteria–Algae symbiotic relationship is an important phenomena for BOD reduction in following treatment system :

- (1) Aerobic pond
- (2) Anaerobic pond
- (3) Anaerobic lagoon
- (4) Aerated lagoon

79. As per IS : 10500-2012, for drinking water, in the absence of alternate source of water, the permissible limit for fluorides is

- |              |              |
|--------------|--------------|
| (1) 1.0 mg/L | (2) 1.5 mg/L |
| (3) 2.0 mg/L | (4) 2.5 mg/L |

80. Noise intensity is measured with which of the following measuring unit ?

- |                |                  |
|----------------|------------------|
| (1) Hertz (Hz) | (2) Decibel (dB) |
| (3) Dynes      | (4) meter/second |

81. In surface water treatment, correct sequence of unit operation is

- (i) Clariflocculation
- (ii) Aeration
- (iii) Filtration
- (iv) Disinfection

**Answer options :**

- (1) (i), (ii), (iii), (iv)
- (2) (ii), (i), (iii), (iv)
- (3) (iii), (i), (ii), (iv)
- (4) (ii), (iii), (iv), (i)

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82. While taking levels from a fixed station if staff is shifted at 5 points, then 'change points' are \_\_\_\_\_.

- (1) Zero (2) 05  
(3) 04 (4) None of the above

83. A level instrument at a height of 1.320 m has been placed at a station having a RL of 115.385 m. The instrument reads - 2.835 on levelling staff held at the bottom of bridge deck. The RL of the bottom of the bridge deck is \_\_\_\_\_ m.

- (1) 111.230 (2) 113.870 (3) 119.540 (4) 116.900

84. A reverse curve consists of \_\_\_\_\_.

- (1) a single curve of a circle connecting two straights  
(2) two arcs of different radii bending in the same direction  
(3) two arcs of equal radii bending in the same direction  
(4) two arcs of equal or different radii bending in the opposite direction

85. Gale's method of traversing consists of plotting the points by :

- (1) Independent coordinates (2) Consecutive coordinates  
(3) Both (1) and (2) (4) Chords

86. The correction for sag is \_\_\_\_\_.

- (1) always additive  
(2) always subtractive  
(3) always zero  
(4) sometimes additive and sometimes subtractive

87. Match List I with List II :

- | <i>List I</i>        | <i>List II</i>  |
|----------------------|---|
| A. Vertical cliff    | I. Contour lines unite at one place to form a single line   |
| B. Steep slope       | II. Contour lines of different elevations cross one another |
| C. Hill              | III. Contour lines are closely spaced                       |
| D. Overhanging cliff | IV. Closed contour lines with higher values inside          |

**Answer options :**

- (1) A-IV, B-III, C-I, D-II (2) A-I, B-III, C-IV, D-II  
(3) A-I, B-II, C-IV, D-III (4) A-IV, B-II, C-I, D-III

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P.T.O.

88. The shape of vertical curve is :

- (1) Circular      (2) Parabolic      (3) Spiral      (4) Elliptical

89. If the WCB of a line is  $170^\circ 40'$ , the quadrantal bearing is

- (1) S  $9^\circ 20'$  E      (2) N  $10^\circ 40'$  W      (3) S  $9^\circ 20'$  W      (4) N  $9^\circ 30'$  E

90. The following are the instrumental methods used for setting out horizontal circular curve.

- (i) Rankine's method of tangential angle  
 (ii) Two theodolite method  
 (iii) Tacheometric method

The sequence of these methods from the least accurate to the most accurate is

**Answer options :**

- (1) (i), (ii), (iii)      (2) (ii), (iii), (i)  
 (3) (iii), (i), (ii)      (4) (i), (iii), (ii)

91. The purpose of making a hydrographic survey is :

- (1) to determine the quantities of subaqueous excavations  
 (2) to measure areas subjected to souring and silting in harbours  
 (3) to measure soundings and preparing navigation charts  
 (4) All of the above

92. Anushka's father, for her marriage, published in a marriage magazine, "To marry with my daughter, the candidate must have been placed through MPSC Examinations". It's an example of \_\_\_\_\_.

- (1) Specification      (2) Tender  
 (3) Contract      (4) None of the above

93. Same type of work under different conditions and nature shall be measured :

- (1) under the same item      (2) separately under the same item  
 (3) separately under separate item      (4) None of the above

94. Pick up the measurement which is **not** made in square meters for payment.

- (1) Timbering or planking and strutting for protecting the sides of trench up to 1.5 m depth.  
 (2) Surface dressing up to 15 cm depth.  
 (3) Surface excavation up to 30 cm depth.  
 (4) Clay puddle work placing in layer of 15 cm.

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95. The quantity of stone grit required for tar and bitumen road should be measured in :
- (1) cum per sq.m (2) kg per sq.m  
(3) kg per cum (4) quintal per sq.m
- 
96. If a large piece of land is required to be divided into plots after providing roads, parks, etc., which method of valuation is suitable ?
- (1) Valuation based on cost  
(2) Valuation based on profit  
(3) Belting method of valuation  
(4) Development method of valuation
- 
97. Revised Estimate is prepared when the :
- (1) Original sanctioned estimate exceeds by 10%  
(2) Revision of work is up to 7%  
(3) Original sanctioned estimate exceeds by 1%  
(4) Original sanctioned estimate exceeds by 5%
- 
98. Which document does **not** contain engineering contract documents ?
- (1) Tender notice (2) Security deposit receipt  
(3) Specifications (4) Schedule B
- 
99. Which are the main sources from which information regarding specifications of civil engineering works can be obtained ?
- (1) Contract drawings (2) Previous specifications  
(3) Site investigations (4) All of the above
- 
100. Coefficient of annual sinking fund ( $I_c$ ) can be determined by
- (1)  $I_c = \frac{i}{(1+i)-1}$  (2)  $I_c = \frac{i^n}{(1+i)^n - 1}$   
(3)  $I_c = \frac{i}{(1+i)^n - 1}$  (4)  $I_c = \frac{i}{(1+i)^n}$

### सूचना — (पृष्ठ 1 वरून पुढे.....)

- (8) प्रश्नपुस्तिकेमध्ये विहित केलेल्या विशिष्ट जागीच कच्चे काम (रफ वर्क) करावे. प्रश्नपुस्तिकेव्यतिरिक्त उत्तरपत्रिकेवर वा इतर कागदावर कच्चे काम केल्यास ते कॉपी करण्याच्या उद्देशाने केले आहे, असे मानले जाईल व त्यानुसार उमेदवारावर शासनाने जारी केलेल्या “परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचे अधिनियम-82” यातील तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एक वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.
- (9) सदर प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपल्यानंतर उमेदवाराला ही प्रश्नपुस्तिका स्वतःबरोबर परीक्षाकक्षाबाहेर घेऊन जाण्यास परवानगी आहे. मात्र परीक्षाकक्षाबाहेर जाण्यापूर्वी उमेदवाराने आपल्या उत्तरपत्रिकेचा भाग-1 समवेक्षकाकडे न विसरता परत करणे आवश्यक आहे.

### नमुना प्रश्न

Pick out the correct word to fill in the the blank :

**Q.No. 201.** I congratulate you \_\_\_\_\_ your grand success.

- (1) for (2) at  
(3) on (4) about

ह्या प्रश्नाचे योग्य उत्तर “(3) on” असे आहे. त्यामुळे या प्रश्नाचे उत्तर “(3)” होईल. यास्तव खालीलप्रमाणे प्रश्न क्र. 201 समोरील उत्तर-क्रमांक “(3)” हे वर्तुळ पूर्णपणे छायांकित करून दाखविणे आवश्यक आहे.

प्र. क्र. 201.

- ① ② ● ④

अशा पद्धतीने प्रस्तुत प्रश्नपुस्तिकेतील प्रत्येक प्रश्नाचा तुमचा उत्तर-क्रमांक हा तुम्हाला स्वतंत्ररीत्या पुरविलेल्या उत्तरपत्रिकेवरील त्या त्या प्रश्नक्रमांकासमोरील संबंधित वर्तुळ पूर्णपणे छायांकित करून दाखवावा. ह्याकरिता फक्त काळ्या शाईचे बॉलपेन वापरावे, पेन्सिल वा शाईचे पेन वापरू नये.

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विषय :- स्थापत्य अभियांत्रिकी पेपर क्र. २

महाराष्ट्र लोकसेवा आयोगामार्फत दिनांक १८ डिसेंबर, २०२१ रोजी आयोजित "महाराष्ट्र स्थापत्य अभियांत्रिकी सेवा, (मुख्य) परीक्षा २०२०" (स्थापत्य अभियांत्रिकी पेपर क्र.-२) या परीक्षेची उत्तरतालिका उमेदवारांच्या माहितीसाठी आयोगाच्या संकेतस्थळावर प्रसिध्द करण्यात आली होती. त्यासंदर्भात उमेदवारांनी अधिप्रमाणित (Authentic) स्पष्टीकरण देऊन ऑनलाईन पध्दतीने सादर केलेल्या हरकती, तसेच तज्ज्ञांचे अभिप्राय विचारात घेऊन, आयोगाने उत्तरतालिका सुधारित केली आहे. या उत्तरतालिकेतील उत्तरे अंतिम समजण्यात येतील. यासंदर्भात आलेली निवेदने विचारात घेतली जाणार नाहीत व त्याबाबत कोणताही पत्रव्यवहार केला जाणार नाही, याची कृपया नोंद घ्यावी.

## उत्तरतालिका - KEY

प्रश्न क्रमांक	उत्तरे			
	संच A	संच B	संच C	संच D
1	2	4	3	3
2	2	2	4	1
3	2	3	2	3
4	4	4	1	4
5	4	1	3	1
6	1	4	2	1
7	3	2	4	2
8	3	1	3	2
9	1	2	2	2
10	2	2	3	1
11	3	2	4	3
12	4	3	2	4
13	3	3	3	1
14	4	3	4	2
15	4	1	3	2
16	1	2	2	2
17	1	3	#	1
18	4	3	4	3
19	4	#	3	4
20	2	4	2	2
21	3	#	1	3
22	4	1	2	4
23	1	1	3	1
24	4	3	1	4
25	2	2	3	4

प्रश्न क्रमांक	उत्तरे			
	संच A	संच B	संच C	संच D
26	1	1	2	2
27	2	2	2	4
28	2	3	3	3
29	2	4	1	2
30	3	2	3	2
31	3	1	4	2
32	3	3	1	4
33	1	2	1	4
34	2	4	2	1
35	3	3	2	3
36	3	2	2	3
37	#	3	1	1
38	4	4	3	2
39	#	2	4	3
40	1	3	1	4
41	1	4	2	3
42	3	3	2	4
43	2	2	2	4
44	1	#	1	1
45	2	4	3	1
46	3	3	4	4
47	4	2	2	4
48	2	1	3	2
49	1	2	4	3
50	3	3	1	4

प्रश्न क्रमांक	उत्त			
	संच A	संच B	संच C	संच D
51	2	1	4	1
52	4	3	4	4
53	3	2	2	2
54	2	2	4	1
55	3	3	3	2
56	4	1	2	2
57	2	3	2	2
58	3	4	2	3
59	4	1	4	3
60	3	1	4	3
61	2	2	1	1
62	#	2	3	2
63	4	2	3	3
64	3	1	1	3
65	2	3	2	#
66	1	4	3	4
67	2	1	4	#
68	3	2	3	1
69	1	2	4	1
70	3	2	4	3
71	2	1	1	2
72	2	3	1	1
73	3	4	4	2
74	1	2	4	3
75	3	3	2	4

प्रश्न क्रमांक	उत्तरे			
	संच A	संच B	संच C	संच D
76	4	4	3	2
77	1	1	4	1
78	1	4	1	3
79	2	4	4	2
80	2	2	2	4
81	2	4	1	3
82	1	3	2	2
83	3	2	2	3
84	4	2	2	4
85	1	2	3	2
86	2	4	3	3
87	2	4	3	4
88	2	1	1	3
89	1	3	2	2
90	3	3	3	#
91	4	1	3	4
92	2	2	#	3
93	3	3	4	2
94	4	4	#	1
95	1	3	1	2
96	4	4	1	3
97	4	4	3	1
98	2	1	2	3
99	4	1	1	2
100	3	4	2	2,

# ने दर्शविलेले प्रश्न रद्द करण्यात आलेले आहेत.