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Omkar Shendure
1999 MPSC

CODE NO.: WCP – I

1999
CIVIL ENGINEERING (Paper – I) 1394

Time: 3 Hours

Max. Marks: 200

N.B.: 1) *Solve TWO questions from EACH Section.*
2) *If more than TWO questions are attempted in a Section, the excess WILL BE IGNORED.*
3) *Figures to the RIGHT indicate the number of marks for the question.*
4) *Use of Log-table, Non-programmable Calculators IS PERMITTED.*
5) *Make suitable assumptions, IF NECESSARY and state them.*

SECTION A

1. a) A player throws a ball with an initial velocity of 18 m/s at an angle of projection α with horizontal towards a vertical wall at a distance of 15 m ahead of him.
Determine:
i) The maximum height 'h' at which the ball can strike the wall.
ii) The corresponding angle α.

b) The rate of change of acceleration is known as "jerk". If the jerk of an elevator is limited to $\pm$ 0.5 m/s^2 per second,
Determine:
i) The shortest time required for the elevator starting from rest, to rise 15 m and stop.
ii) The corresponding average velocity. 10

2. a) Collars A and B are connected by 440 mm wire and may slide freely on frictionless rods. If a force Q of magnitude 450 N is applied to collar A as shown in fig. 1. determine:
i) The tension in the wire when C = 80 mm.
ii) The corresponding magnitude of force P required to maintain the equilibrium of the system. 10

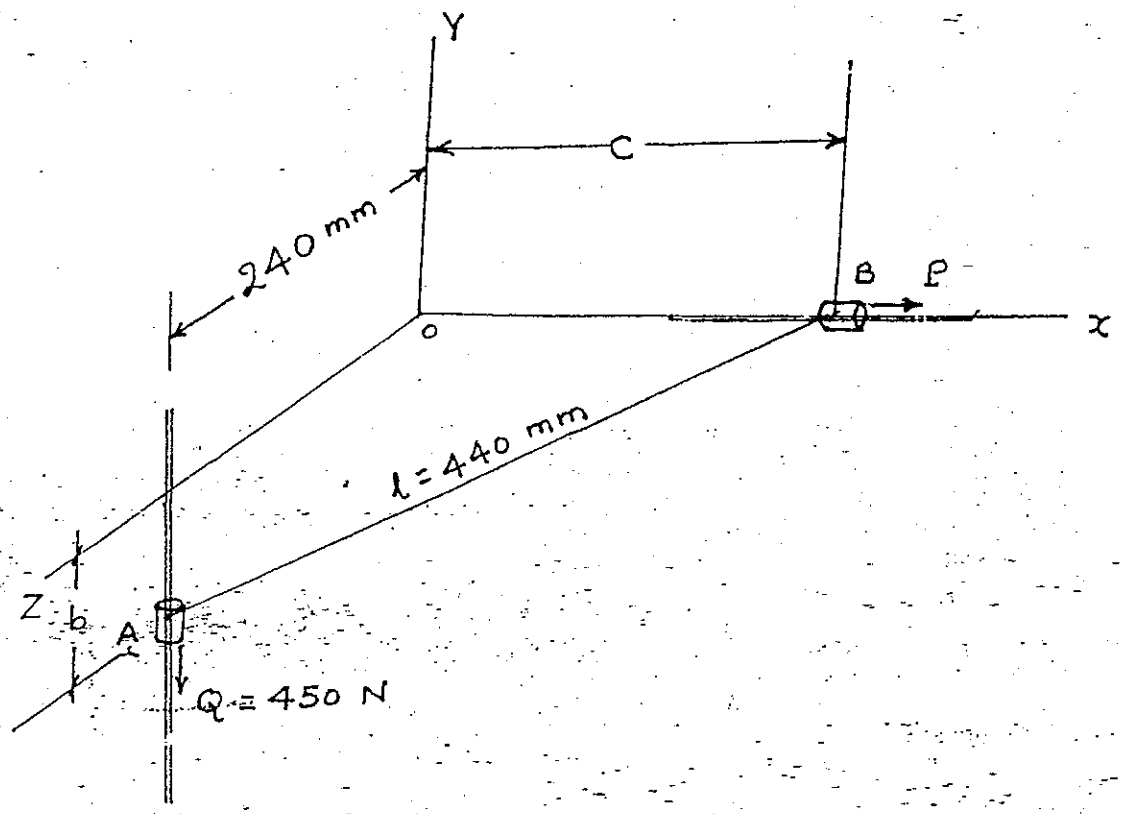

Fig 1

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b) A 1.2 m rod, of uniform cross section is held in equilibrium as shown in fig. 2, with one end against a frictionless vertical wall and the other end is attached to a cord. Determine the length of the cord. 10

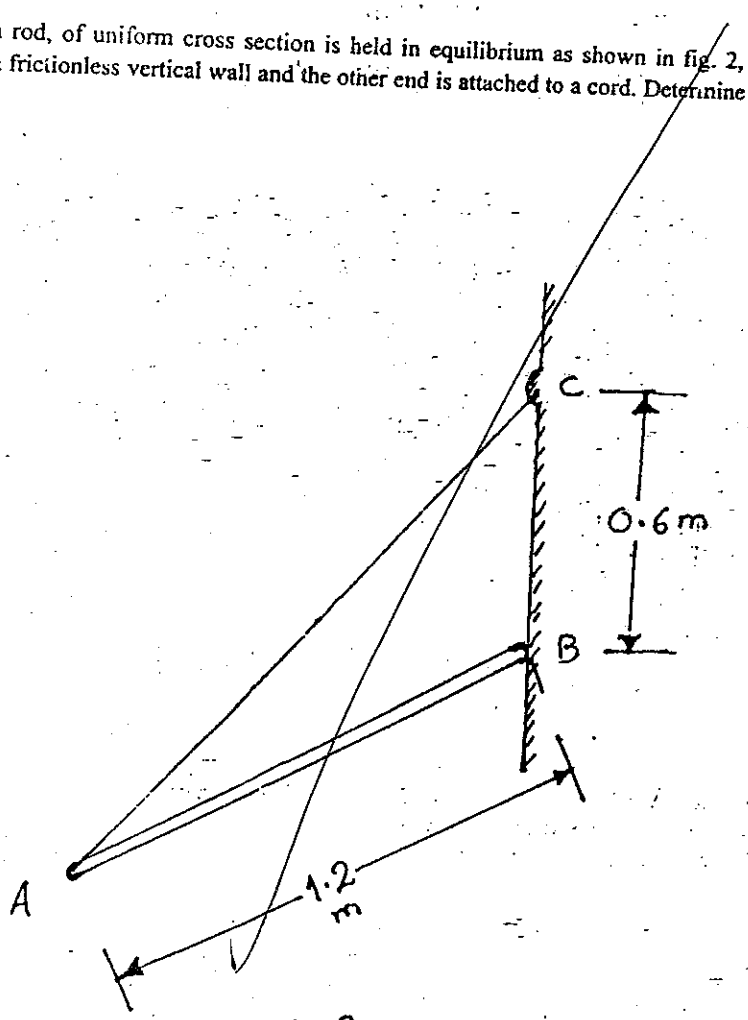


Fig 2

3. a) A beam AB simply supported at the ends A and B; span 4 m. It is loaded by a point load 20 kN at D; AD = 1 m and a uniformly distributed load of 10 kN/m over CB; C being the mid point of the beam.

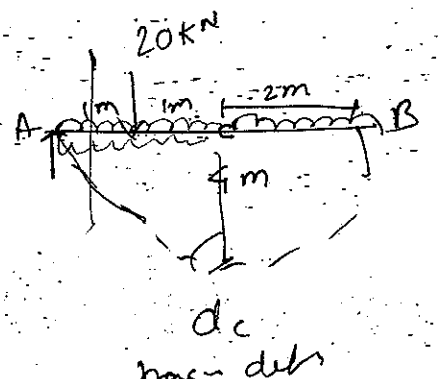
Determine:

i) Deflection at C.

ii) Maximum deflection.

iii) Slope at A.

Take E = 200 GPa $I = 20 \times 10^{-6}\ m^4$ 10



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b) The magnitude and directions of the stresses on two planes intersecting at a point are as shown in fig. 3. Determine the magnitudes and directions of the Principal Stresses at this point. Sketch your results on an element. 16

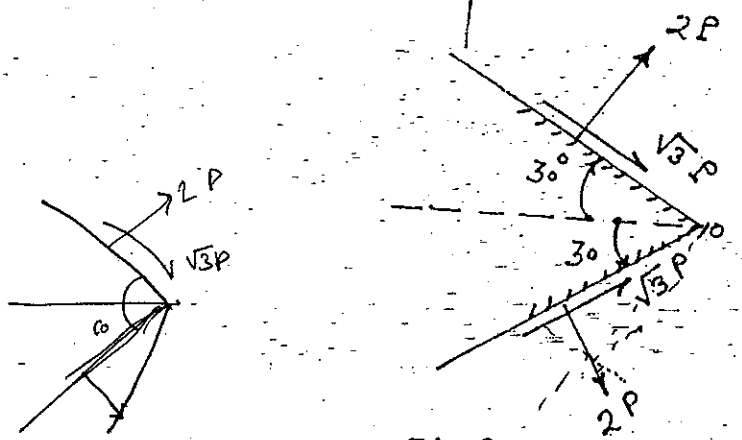
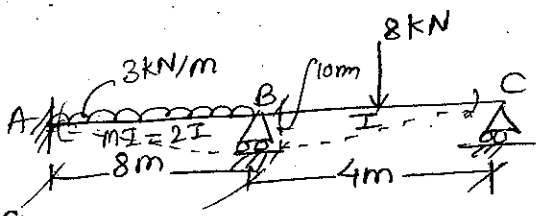


Fig 3

SECTION B



4. a) A continuous beam ABC is fixed at A and is on rollers at B and C;
AB = 8 m; MI = 2I
BC = 4 m; MI = I
It carries a UDL of intensity 3 kN/m over AB and a point load of 8 kN ↓ at the centre of BC. During the loading the support B sinks by 10 mm. Using Moment Distribution method of analysis, determine the support moments.
Take I = 1600 cm^4.
E = 200 GPa. 10^9 N/m^2 Giga 10

b) A truss as shown in fig. 4 is loaded by a horizontal force W at joint A. The cross sectional areas and materials of all the members are same.
Find the force in the member BC. 10

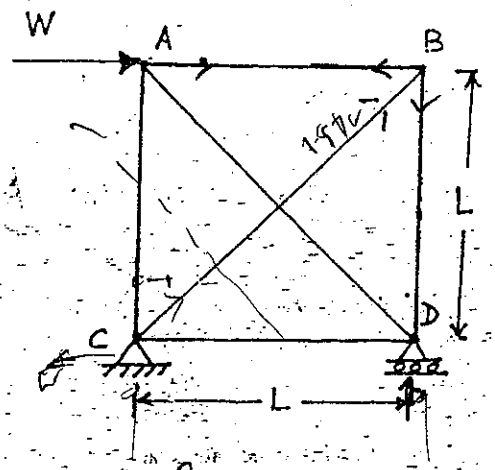


Fig 4.

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5. a) Draw Influence lines for forces in members U_2U_3, U_2l_2, l_1l_2 of the truss shown in fig.5. If a uniformly distributed load of intensity 10 kN/m and of length 5 m traverses the girder, calculate the maximum force in the inclined member U_2l_2. 10

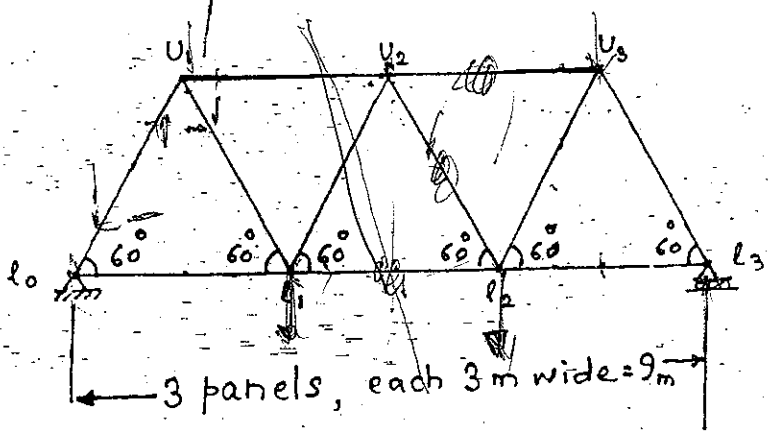

Fig. 5

b) For a simply supported beam of span 3 m, draw influence lines for:
   i) SF at 2 m from left support.
   ii) BM at 1 m from left support.

If a UDL of intensity 10 kN/m longer than the span moves over the beam from left to right, calculate the SF and BM at the respective sections by using the influence line diagrams. (Max. Values). 10

6. a) A built up column consists of ISHB 400 @ 77.4 kg/m with one 300 mm×12 mm flange plate on each side. The column carries an axial load of 2400 kN. Design a gusseted base, if the column is supported on concrete pedestal with a bearing capacity of 4 MPa.

Draw neat sketches indicating the details of your design. 10

b) A simply supported beam of span 10 m with overhangs of 3.5 m on either side, is carrying a U.D. load of 25 kN/m over its entire length of 17 m. Design a suitable beam from MB series satisfying I.S.800 Code.

Assume that,
   i) The beam is laterally loaded.
   ii) The support width is 200 mm.
   iii) The fillet depth is 0.1 times the depth of the beam.
   iv) Steel is conforming to IS 226. 10

SECTION C

7. A hall measures 10 m × 6 m from inside and has wall thickness 400 mm. Design a suitable R.C.C T-beam roof to carry a superimposed load of 2 kN/m^2. Use M15 Concrete and take σ_{st} = 140 MPa. Assume unit weight of concrete as 24 kN/m^3.

Your design should consists of:
   i) Design of continuous slab with usual checks for shear and development length.
   ii) Design of T beams with checks for shear and development length.

Draw sketches of L sections of slab and beams to indicate details of reinforcements. Use working stress method. 20

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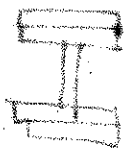

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8. Design an isolated square footing for a column 500 mm×500 mm transmitting a load of 600 kN and a moment of 30 kN-m. The safe bearing capacity of soil is 120 kN/m^2. 10

Use M15 grade of concrete and σ_{st} = 140 MPa. Use working stress method.

Draw neat sketches showing the sectional elevation and sectional plan of the footing containing details of reinforcements.

Design calculations should consists of:-

i) Design constants.

ii) Size of footing.

iii) Cal. for 'd' of footing.

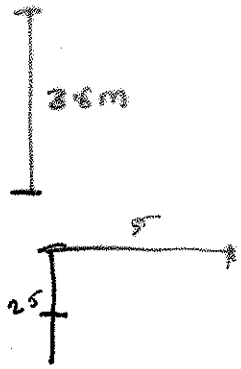
iv) Check for shear.

v) Cal. of A_{st}.

vi) Check for development length etc.

20

9. Design and dog legged stair for a building in which the vertical distance between the floors is 3.6 m. The stair hall measures 2.5 m×5 m. The live load may be taken as 2500 N/m^2. Use M15 concrete and Fe 250 reinforcement.



Use limit state method for design.

Your design must contain

i) Calculation for planning of general layout of stair.

ii) Design constants calculations.

iii) Loading calculations on each flight.

iv) Computation of design BM and design SF, depth of waist slab, reinforcement details etc. etc.

v) Usual checks.

Draw sketches showing general arrangement of stair (landing, steps, passage etc.)
Also sketch 'L' section of a flight showing details of main and distribution steel.

20

SECTION D

10. A prestressed concrete beam with a single overhang is simply supported at A and B over a span of 8 m and the overhang BC is 2 m. The beam is of rectangular section 300 mm wide and 900 mm deep and supports a UD Load of 3.52 kN/m over the entire length in addition to its self weight.

Determine the profile of the pressing cable with an effective force of 500 kN which can balance the dead load and live load on the beam. Design the profile of the cable along the length of the beam. Sketch the profile.

20

11. A prestressed concrete bridge deck is an unsymmetrical I section beam spanning over 20 m. The dimensions of I section are:

Top flange	–	1200 × 200	mm
Middle Web	–	900 × 200	mm
Bottom flange	–	500 × 400	mm
		(width)	(depth)

The beam is prestressed by 7 Freyssinet cables, each carrying an effective force of 660 kN located at 200 mm from the soffit at the centre of span section. If the total max. B.M. at the centre of span of bridge is 3600 kN-m, estimate the resultant stress developed at the section using the internal resisting couple method.

20

12. Write short notes on:

a) Concrete Mi... – steps, significance various methods.

b) Ready Mix concrete – concept, significance, utility machinery, advantages etc.

c) Losses in Prestressed Concrete – types, causes, remedy, expression for losses etc.

d) Admixtures used in concrete – types, significance, utility etc.

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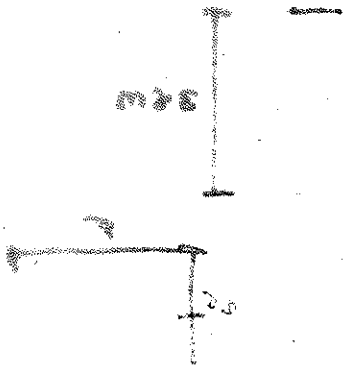

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SECTION E

13. Analyse the continuous beam ABC by stiffness method. Determine support moments. Plot S.F.D. and B.M.D. Take EI constant (Fig. 6) 20

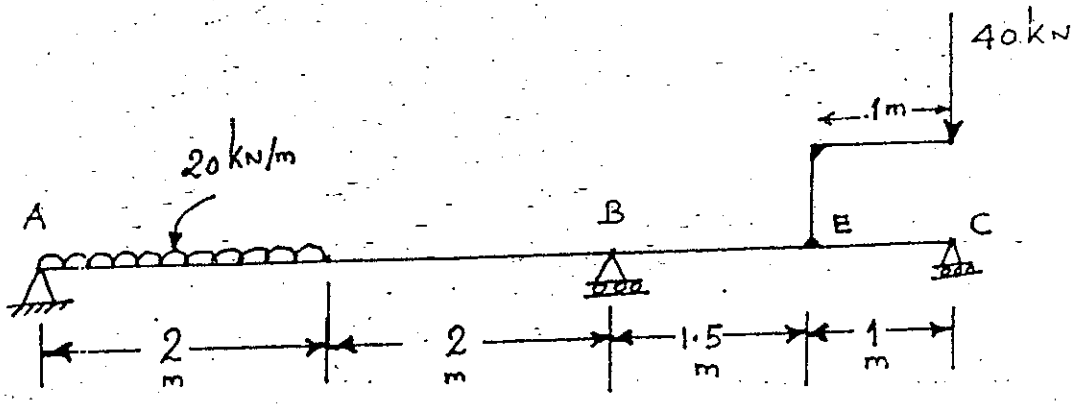

Fig.6

14. Obtain reaction components at the hinge support C by using flexibility method. Take EI constant. Ref. Fig. 7
Construct BM diagram and draw elastic curve. 20

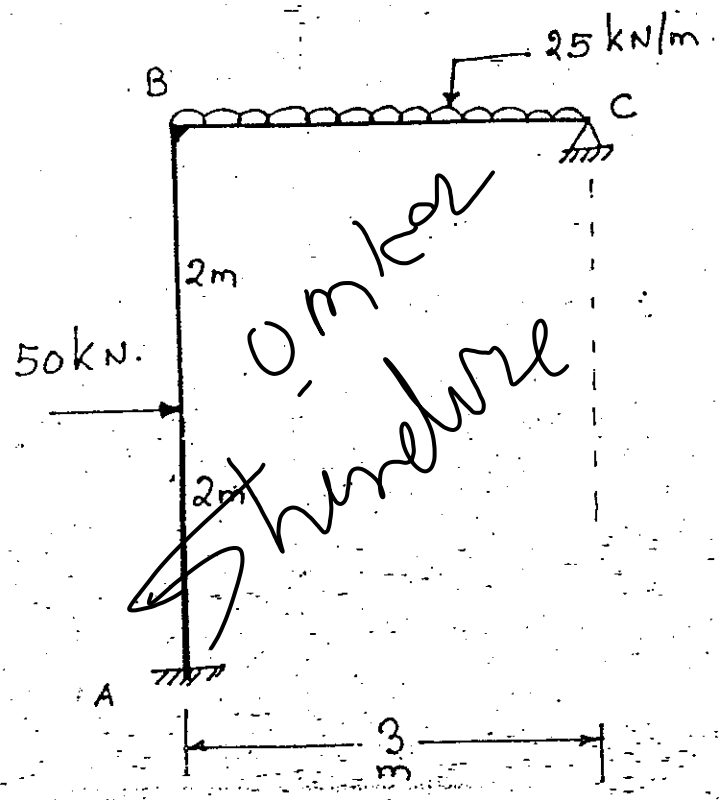

Fig. 7

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15 Write detailed notes on the following methods used under Numerical approach of analysis to solve structural problems.

a) Functional Approximation Method.

b) Finite Difference Method.

c) Finite Element Method.

Illustrate your answer by sketches to substantiate the same. 20

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CODE NO.: WCP–II

1999
CIVIL ENGINEERING (Paper – II)

2743

Time: 3 Hours

Max. Marks: 200

N.B.: 1) *Solve TWO questions from EACH Section.*
2) *If more than TWO questions are attempted in a Section, the excess will be ignored.*
3) *Figures to the RIGHT indicate the number of marks for the question.*
4) *Make suitable assumptions, if NECESSARY and state the same.*
5) *Use of log table, non-programmable calculators is PERMITTED.*

SECTION A
(Surveying)

1. a) Enlist the errors involved in levelling. Find out missing readings (marked thus X) and complete. Also apply usual checks. Underline complied entries. (7)

Sr. No.	B.S.	I.S.	F.S.	H.I.	R.L.	Remark
1	2.450	–	–			B.M.1
2	3.280	–	0.375			C.P.
3	–	X	–	–	453.805	–
4	–	2.345	–	–	X	–
5	–	2.990	–	–	452.365	–
6	X	–	3.665	454.415	X	C.P.
7	2.110	–	X	X	453.960	C.P.
8	–	1.370	–	–	X	–
9	–	–	1.425	–	X	B.M.2

b) What is differential levelling? Where do you require the same? Explain with a sketch how would you calculate difference in levels between two points P and Q which are separated by a hillock. (7)

c) Explain with a sketch how would you measure the height of a transmission tower by using a theodolite. (6)

2. a) Explain with sketches the following characteristics of contours by selecting numerical values.
i) Ridge and valley
ii) Hill and depression
iii) Vertical cliff
iv) Steep and uniform slope. (7)

b) Define relief and derive expression for displacement due to ground relief with a sketch. (7)

c) x and y are two images of the base and top of a factory chimney of 150 m high, respectively. The images are observed in a truely vertical aerial photograph. The scale of photograph 1: 10,000. Determine the position x when y is 70.00 mm from the principal point of the photograph. Assume the focal length of the camera to be 125 mm and the chimney to be at datum level. Draw the sketch of the proposal. (6)

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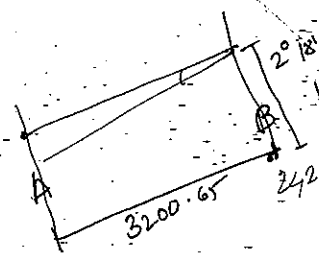
3. a) Compare with sketches and in tabular form the grid iron and central system of triangulation. (7)

b) Write short note on Distomat giving a sketch, procedure use, accuracy and range. (7)

c) A and B stations in triangulation are 3200.65 m apart. Find the difference of elevation of two stations by using the following data:

i) Angle of depression @ B to A	2°-18'-16"
ii) Height of signal @ A	4.23 m
iii) Height of instrument @ B	1.24 m
iv) Coefficient of refraction @ B	0.07
v) R Sin 1"	30.88 m
vi) R.L. of B.	242.6 m



(6)

4. a) Explain with a sketch the setting out method for bridge pier. (7)

b) Explain temporary adjustment of theodolite. (7)

c) Calculate angle ACB by using the following data:

i) Directions observed from satellite station 'S' which is 62.18 m from C.

ii) ∠A 0° 0' 00"

iii) ∠B... 71° - 54' - 32"

iv) ∠C... 296° - 12'- 02"

v) Length AC = 8240.6 m and length BC... 10863.6 m. Draw the sketch of the proposal. (6)

SECTION B
(Engineering Materials and Geology)

5. a) Enlist three important components of cement and indicate what properties are promoted by these components. Enumerate four important physical properties of cement and state how would you determine the same. (7)

b) For deccan trap state the range of values for crushing strength (kN/m²); specific gravity and modulus of elasticity (kN/m²) and Poisson's ratio. What factor of safety would you recommend over minimum value of crushing strength ? Also indicate with a sketch how would you determine the crushing strength in laboratory. (7)

c) Draw a neat sketch in plan of Bull's Kiln and explain various operations in manufacturing. Prepare a table to show the properties of 1st class bricks such as modular dimensions, efflorescence, water absorption and crushing strength in N/cm². (6)

6. a) In connection with cement mortar, state the following:

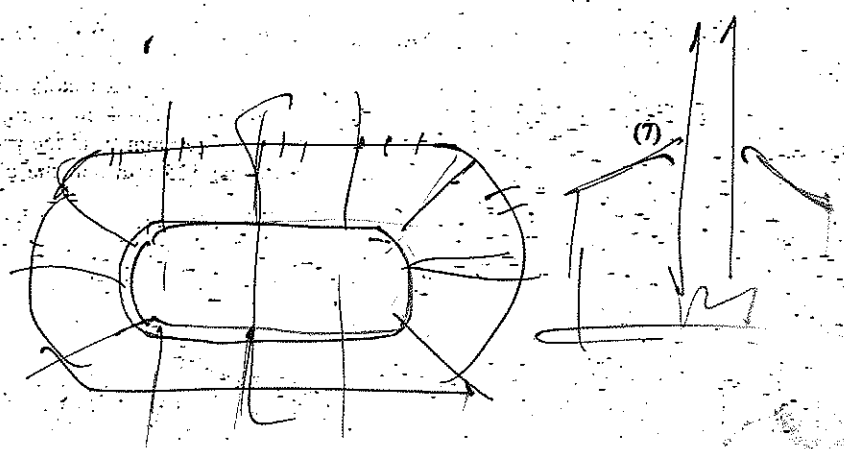
i) Components

ii) Proportions

iii) Strength

iv) Consistency

v) Gauged mortar. (7)



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b) In connection with oil paints, indicate the following:

i) Ingredients.

ii) Types.

iii) Steps in painting of new wood work.

iv) Tools for surface preparation.

v) Mechanical appliances for painting. (7)

c) Explain with sketches four important defects of timber. (6)

7. a) Explain engineering classification of rocks based on:

i) Weathering.

ii) Uniaxial compressive strength.

iii) Modulus ratio. (7)

b) Explain with a sketch the seismic method of geophysical investigation. Calculate thickness of upper layer using the following data:

i) The distance between shock point and receiver - 100 m.

ii) Wave velocity V_1.... 600 m/sec.

iii) Wave velocity V_2= ....1500 m/sec. (7)

c) Explain the concept of Rock Quality Designation and give the classification of rock based on the same. Calculate values of core recovery and R.Q.D. from the following data:

i) Total core recovery.... 265 cm.

ii) Total Core Run.... 300 cm.

iii) Modified core recovery.... 242 cm.

Comment on results regarding quality of rock. (6)

8. Explain with sketches the following defects in rock masses in respect of concept involved, different types, and how the problems (atleast one each) connected with these for engineering structures are attempted.

a) Fords b) Faults c) Joints. (20)

SECTION C
(Building Construction)

9. a) Explain five factors affecting the thickness of load bearing brick masonry walls. Draw a sketch of nomogram accommodating these factors. (7)

b) Explain with a sketch the concept involved in the analysis of stepped footing for continuous wall on the following points:

i) Depth of foundation.

ii) Bottom width and thickness of concrete block.

iii) Masonry offsets from wall at ground level to top of concrete block. (7)

c) How do you designate door and window frames of timber ? Also explain the meaning of following :

i) 10 DT 20

ii) 10 WT 12

iii) 10 V 6

iv) 6 WS 12 (6)

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10. a) Illustrate with a sketch in plan atleast nine components of building drainage from private premises to public server. Also state various norms involved in planning. (7)

b) Enlist six important factors affecting selection of flooring for ground floor. Discuss with suitable examples any two of them. (7)

c) Explain with neat sketches and proper reasons where would you adopt the following masonry:

i) Fine Ashaler Construction.

ii) Coursed Random Rubble.

iii) Dry Stone Revetment. (6)

11. a) Write down detailed specifications for cement concrete (1:2:4) for, building work. (7)

b) Work out quantities/numbers, required for preparing rate analysis of 1st class brick work in cement, sand mortar (1:6) including supply of all materials, labour and T. and P. etc. for 10 m^3 quantity. (7)

c) Explain three methods of estimating earth work in banks with suitable diagrams. (6)

12. a) Work out the standard rent per floor per month. Use the following data:

i) Cost of building with 3 floors..... 1.2 lakhs.

ii) Plot area ..... 600 m^2 having purchased for Rs. 18,000/-.

iii) Present rate of plot..... Rs. 45/- m^2.

iv) Municipal taxes..... 35% of ratable value.

v) Collection and management charges at 3% of gross rent.

vi) Repairs at 1% on 9/10 of cost of construction.

vii) Sunking fund at 5% for 65 years on 90% cost of construction.

viii) Miscellaneous expenses at Rs. 60/- per month. (7)

b) Enlist five different methods of termination of contract and discuss any two of them. (7)

c) Enlist eight different points required to be mentioned in the tender notice and give details of the following:

i) Scrutiny of tender.

ii) Acceptance of tender. (6)

SECTION D
(Geotechnical Engineering)

13. a) Starting with fundamentals, derive the following relationships:

i) Void Ratio (e) and porosity (n).

ii) Water contents (w), Degree of saturation (Sr) and void ratio (e). (7)

b) State and explain Boussinesq's formula for stress distribution. Determine vertical stress increment at 10m depth below centre of columns. Use the following data.

i) Four column loads of 1000 kN each.

ii) Spacing of columns 4m c/c. (7)

c) Draw a neat sketch of set up of direct shear test, name components and explain procedure in few steps. Also sketch stress strain relation for dense and loose sand. (6)

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14. a) Illustrate with sketches the spring analogy method of soil consolidation. Prepare a table to show how the following soil parameters are represented in the model.

i) Soil framework.

ii) Pore water.

iii) Soil modulus.

iv) Permeability.

v) Applied total stress.

vi) Pore Pressure. (7)

b) Explain with a sketch the procedure for standard proctor test. How are the relationship in O.M.C. versus dry density differ in standard and modified tests? Also calculate total energy imparted in standard proctor test. (7)

c) Determine the thrust per unit meter length and its point of action from bottom of retaining wall. Use the following data.

i) Wall height 8m. with back vertical.

ii) Supporting soil has dry unit weight of 17.5 kN/m^3 and $\phi = 30°$

iii) Surface of soil .... horizontal with surcharge load of 80 kN/m^2.

Use Rankine theory. (6)

15. a) State and explain Hanson's bearing capacity equation. Explain with a sketch how is the eccentricity ($e \leq B/6$) of vertical is accounted in the analysis. (7)

b) Explain with a sketch the effect of submergence of foundation on its bearing capacity. Determine the safe bearing capacity of a footing of 2m × 2m size located at 1.25m depth in a soil with saturated unit weight of 18.64 kN/m^3. Expected water table level upto 1 m from ground. Assume C' = 10 kN/m^2, N'c, N'q and N'r equal to 11.8, 3.9 and 1.7 respectively. (7)

c) State and explain permissible values for the following parameters:

i) Total settlement for isolated and raft foundation on sand and clay.

ii) Angular distortion for buildings with no cracking condition.

iii) Differential settlements in adjacent columns. (6)

16. a) Draw a neat dimensioned sketch of double under reamed pile of 30 cm diameter and explain how would you determine its load bearing capacity. (7)

b) Illustrate with sketches effect of earth support on anchored single sheet pile wall construction on its deflection, pressure distribution and B.M. diagrams. Find out factor of safety of a cantilever sheet pile which retains 4 m of sandy soil with embedment depth of 5 m. Assume $\phi = 30°$ and approximate method of analysis. (7)

c) Explain with a sketch showing all component parts, two stage well point system for trench construction. Use following data:

i) Ground level .... 100.00 m.

ii) G.W.T ... 98.00 m.

iii) Bottom of foundation ... 90.00 m. (6)

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SECTION E
(Construction, Planning and Management)

17. a) In connection with floats in network analysis, explain:

i) Its definition.

ii) Various types.

iii) Method of their calculations. (7)

b) Following are the details of a project.

Sr No.	Activities	Predecessor Event	Successor Event	Duration in Days
1	A	1	2	4
2	B	1	3	12
3	C	1	4	10
4	D	2	4	8
5	E	2	5	6
6	F	3	6	8
7	G	4	6	10
8	H	5	7	10
9	I	6	7	00
10	J	6	8	8
11	K	7	8	10
12	L	8	9	6

Draw the network diagram. Prepare a table for various timings and find out critical path and time. (7)

c) Explain with a sketch the relation between duration and cost of project for:

i) Total Cost.

ii) Direct Cost.

iii) Indirect Cost.

Also mark crash, optimum and normal durations. (6)

18. a) Explain how would you calculate output of power shovel and enlist eight different factors affecting the output. (7)

b) In connection with a drag-line, explain with a sketch:

i) Basic Components.

ii) Operation.

iii) Use. (7)

c) Sketch the following assembly, name components and state their specific use.

i) Clamshell Bucket.

ii) Whirler Crane.

iii) Travelling Gantries. (6)

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19. a) Explain with a sketch the relation between number of orders per year versus ordering and carrying cost of inventory. From these develop economic order quantity curve. Also derive equation for E.O.Q. (7)

b) Following are the observations of ABC analysis.

i) % of total value (x-axis)	40	70	80	90	100
ii) % number of items (y-axis)	10	15	22.5	30	100

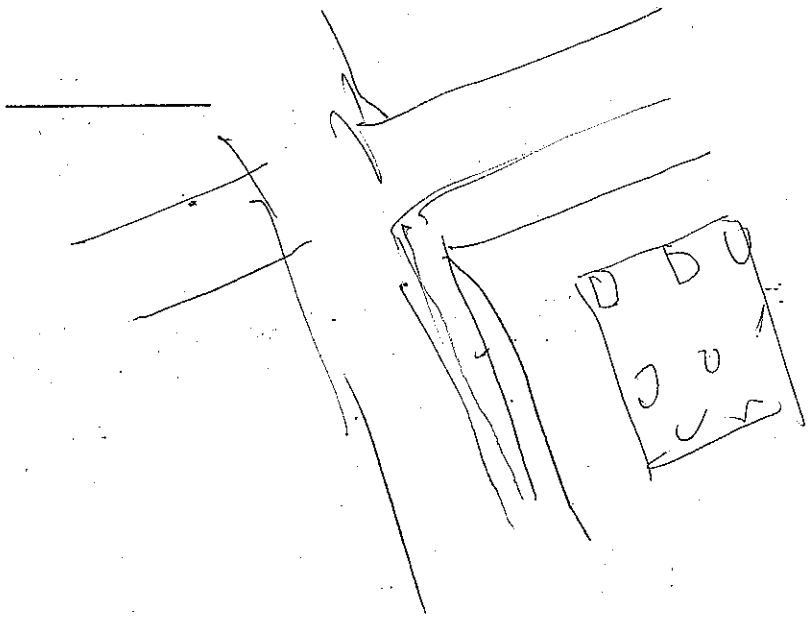
Sketch only the relation and explain with this the concept of ABC analysis. (7)

c) Draw twelve step flow chart for purchase procedure for materials at site. (6)

20. a) Prepare job layout giving all possible details for construction of multi-storeyed R.C.C. building on a plot size of 90 m × 120 m. Roads are facing two sides as above. Construction area ..... 30 m × 60 m. (7)

b) Enlist six different and important aspects of safety programme of a construction firm and elaborate any two. (7)

c) Discuss Iconic; Analogue; and Mathematical model in scientific management of project with suitable examples. (6)



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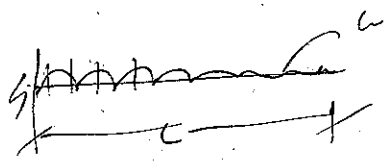
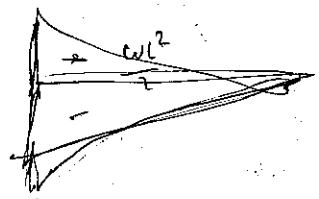
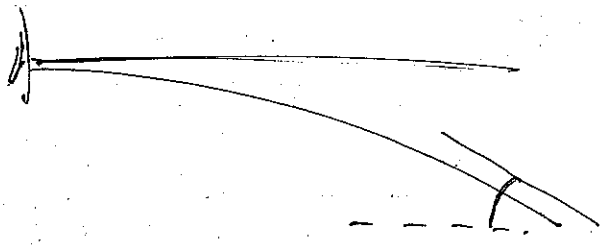
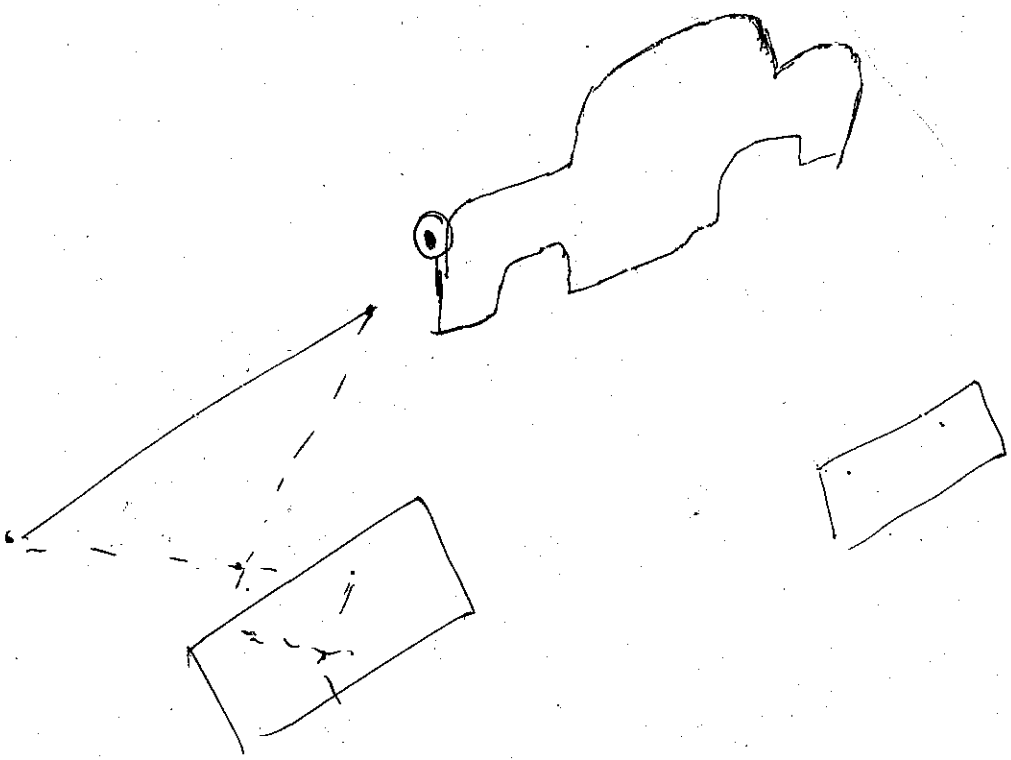






$\frac{wL^2}{2EI}$

$= \frac{1}{3} \frac{wL^2}{2EI} \cdot L \quad = \frac{wL^3}{6EI}$



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CODE NO.: WCP – III

1999
CIVIL ENGINEERING - III

1393

Time: 3 Hours

Max. Marks: 200

N.B.: 1) *Solve any TWO questions from each Section.*
2) *If more than TWO questions are attempted in a Section, the EXCESS will be ignored.*
3) *Figures to the right indicate the number of marks for the questions.*
4) *Make suitable assumptions, if necessary and state the same.*
5) *Use of log tables, slide rule, non programmable calculator is permitted.*

SECTION A

1. a) A cylinder of 150 mm radius rotates concentrically inside a fixed cylinder of 155 mm radius. Both cylinders are 300 mm long. Determine the viscosity of the liquid which fills the space between the cylinders if a torque of 0.98 N-m is required to maintain an angular velocity of 60 rpm. 10

b) Define metacentre. A rectangular barge is 20 m long, 7 m wide and 3 m deep. It has a draft of 2 m when fully loaded. The c.g. of barge is on axis of symmetry at the water surface. Determine the stability consideration of the barge and the matacentric height. 10

2. a) Distinguish between stream function and velocity potential in a fluid flow. The stream function and velocity potential for a flow are given by $\psi = 2xy$, $\phi = (x^2 - y^2)$. Show that the conditions of continuity and irrotational flow are satisfied. 10

b) A pump is installed in a pipeline, 5 cm diameter, carrying oil of sp.gr. 0.83. It returns the oil to a 5 cm diameter pipe at the same elevation with a pressure increase of 13.7 kN/m. The quantity of oil flowing in the pipeline is 10 litres/sec. The motor driving the pump delivers 2.8 kW to the pump shaft. Calculate the loss of energy in the pump. 10

3. a) i) Explain hydraulically efficient channel cross-section. Derive the conditions for a most efficient trapezoidal section in an open channel flow. 5

ii) Distinguish between specific energy and specific force in an open channel. 5

b) A river 45 m wide has a normal depth of flow of 4 m and an average bed slope of 1 in 12000. A weir is built across the river raising the water surface level at the weir site to 5.5 m above the bottom of the river. Assuming that the back water curve is an arc of a circle, calculate the approximate length of the back water curve. Consider that the river is prismatic. Take the value of η in Mannings formula as 0.025. 10

4. a) A spillway model is to be built to a geometrically similar scale of 1/40 across a flume of 50 cm width. The prototype is 20 m high and maximum head on it is expected to be 2 m.

i) What height of the model and what head on the model should be used?

ii) If the flow over the model at a particular head is 10 litres/sec., what flow per metre length of the prototype is expected?

iii) If the negative pressure in the model is 15 cm, what is the negative pressure in the prototype? Is it practicable? 10

b) Three pipes – 250 m long, 25 cm in diameter, 150 m long, 15 cm diameter and 200 m long, 20 cm in diameter are connected in series between two reservoirs. The friction factor values for the 3 pipes are 0.018, 0.020 and 0.019, respectively. Determine the rate of flow if the difference in elevation of water levels between two reservoirs is 15 m. Use $hf = f Lv2/d2g$ for friction loss and account for all losses. 10

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SECTION B

5. a) Explain the various types of precipitations. Explain the methods how the average precipitation over a basin is measured. 10

b) Define infiltration indices. What are the various factors affecting runoff over a catchment ? 10

6. a) Describe with the help of a neat sketch any three methods of separation of base flow from the hydrograph runoff (i.e. stream flow hydrograph) indicating the situations under which you advocate them. 10

b) Distinguish between hydrograph, hyetograph and unit hydrograph. The following are the ordinates of a 3 hr. unit hydrograph. Derive the ordinates of a 6 hr. unit hydrograph and plot the same. 10

Time (hr)	0	3	6	9	12	15	18	21	24
3 hr UGO (cumec)	0	1.6	4.4	8.6	12.8	8.5	4.5	2.2	0.7

7. a) Explain the following terms :
   i) Design flood
   ii) Recurrence interval
   iii) Flood forecasting and warning
   iv) Meandering of river
   v) Probable maximum precipitation. 10

b) Write short notes on the following : 15
   i) The effect of water logging and its control.
   ii) State the conditions under which the lift irrigation is preferred over the other type of irrigation. 10

8. a) Distinguish between: 16.
   i) Water table aquifer and artesian aquifer
   ii) Open well and tube well
   iii) Aquifer, aquiclude and aquitad
   iv) Specific capacity and specific yield. 10

b) An artesian aquifer 25 m thick has a porosity of 17% and bulk modulus of compression 240 N/m². Estimate the storage coefficient of the aquifer. What fraction of this is attributable to the expansibility of water ? Bulk modulus of elasticity of water = 2.14×10^3 N/m². 10

SECTION C

9. a) What do you understand by the terms : 10
   i) Crop ratio
   ii) Overlap allowance
   iii) Capacity factor
   iv) Full supply coefficient.

b) The left canal of a tank irrigation scheme carries a discharge of 8 cumec and has a cultivable commanded area of 8000 hectares. The intensity of rabi crop is 70% and the base period is 110 days. The right canal of the scheme carries a discharge of 20 cumecs and has a cultivable command area of 18000 hectares. The intensity of rabi crop is 80% and the base period is 110 days. Compare the efficiency of the two canal systems.

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10. a) i) Distinguish between elementary profile and practical profile of a gravity dam with neat sketches.
ii) Low gravity dam and high gravity dam. 10

b) Compute the discharge over an ogee weir in the coefficient of discharge C = 2.4 at a head of 2.5 m. The length of the spillway is 100 m. The weir crest is 8 m above the bottom of the approach channel having the same width as that of the spillway. 10

11. a) Explain the necessary of lining of irrigation channels. Using Lacey's theory, design an irrigation channel for the following data :
Discharge Q = 15 cumecs
Silt factor = 1
Side slopes = 1/2:1 10

b) Describe with the help of neat sketches the various types of cross drainage works. 10

12. a) Describe various types of river training and protection works. 10

b) Sketch a suitable cross-section of a guide bank as used in river training works. Explain the process of launching of aprons in such works. 10

SECTION D

13. a) Discuss the factors affecting selection of alignment between two cities. 10

b) List important tests on aggregates with the properties to be tested. Explain one most important test. 10

14. A National Highway passing through a flat terrain has a horizontal curve of radius equal to the ruling minimum radius. If the design speed is 100 kmph, calculate absolute minimum sight distance, super elevation, extra widening and length of transition curve. Assume necessary data suitably. 20

15. a) Estimate the basic capacity of a traffic lane at speed of 60 kmph. Assume all the vehicles are of average length of 6 meters. 10

b) Explain the relationship between speed, volume, density and level of service. 10

16. a) For concrete pavements, explain radius of relative stiffness, modulus of subgrade section. 10

b) Explain CBR method of pavement design and its limitations. 10

SECTION E

17. a) Derive an expression for the economic span for the bridge. 10

b) Explain Linear waterway and afflux. 10

18. a) List the loads, forces and stresses to be considered for the design of road bridges and culverts. 10

b) Explain impact allowance for IRC bridge loadings. 10

19. a) Calculate the design strength of concrete. 10

b) Explain traffic aspects of highway bridges. 10

20. a) Explain the erection of long span concrete bridge by incremental push launching method. 10

b) Differentiate with sketches any three of the following moveable bridges :
i) Bow string girder
ii) Balanced cantilever
iii) Bascule bridge
iv) Suspension bridge
v) Swing bridge. 10

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It has several Compartments, Focus, Luck etc
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कोशिश करनेवालो की कभी हार नही होती...
↳ = संघर्ष = प्रयत्न = ____

PWD - 455 ~~Fail~~ / 407

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