

2007

CIVIL ENGINEERING (Optional)

000093

स्थापत्य अभियांत्रिकी (वैकल्पिक)

Time : 3 hours

Maximum Marks : 200

- Note :
- In all attempt Five Questions.
 - Question No. 1 is Compulsory.
 - Of the remaining Questions. Attempt Any four by selecting One Question from each section.
 - Numbers of optional questions upto the prescribed number in the order in which questions have been solved, will only be assessed and excess answers of the question/s will not be assessed.
 - Non programmable calculator is allowed to use.
 - Candidate should not write roll number, any names (including their own), signature, address or any indication of their identity anywhere inside the answer book otherwise he will be penalised.

1. Attempt any four of the following : (10 Marks each)

40

- What are the desirable characteristics of a good building stone ? Give few of these above characteristics for basalt ?
- Two identical horizontal cantilevers AB and CD of length $2L$ are connected at their free ends by a rigid vertical members BD as shown in fig 1. A point load W is applied at the centre of CD. If $W = 0.24\text{KN}$, $L = 1\text{m}$, $E = 2 \times 10^5\text{N/mm}^2$ and $I = 200 \times 10^3\text{mm}^4$. Calculate the vertical deflection of point 'D'.

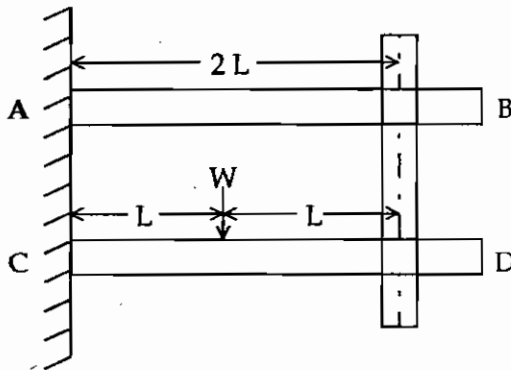


Figure No. 1 (Not to Scale)

- (c) Define "Duty and Delta". The culturable command area of a water course is 1200 hectares. Intensities of Sugarcane and Wheat crops are 20% and 40% respectively. The duties for the crops at the head of water course are 730 hectares per cumec and 1800 hectares/cumec respectively.

Find :

- (i) the discharge required at the head of the water course.
- (ii) determine the design discharge at the outlet assuming a time factor equal to 0.8.
- (d) What are the advantages of using a CPM network in execution of a project ?
- (e) In the "Critical Path Method". Define : Activity, Event, Dummy activity, Total float and Free float.

Section A

2. Answer the following subquestions :

- (a) A ball is thrown vertically upward from the 12m level in an elevator shaft with an initial velocity of 18m/s. At the same time instant an open platform elevator passes the 5m level, moving upward with a constant velocity at 2m/s.

Determine -

15

- (i) When and where the ball will hit the elevator
- (ii) The relative velocity of the ball with respect to the elevator when the ball hits the elevator.
- (b) What do you understand by remote sensing ? Explain with help of a neat sketch an idealized remote sensing system. Write a note on application of remote sensing.

15

- (c) List various types of contracts. Write the advantages and disadvantages of an Item rate contract or Lump-sum contract.

10

3. Answer the following sub questions :

- (a) A truss as shown in fig. 2 is loaded by two points loads of 100kN each at point B and D. Assuming that cross sectional areas and materials of all the members are same, calculate the forces in the members BC, EC and CF by method of joint. 15

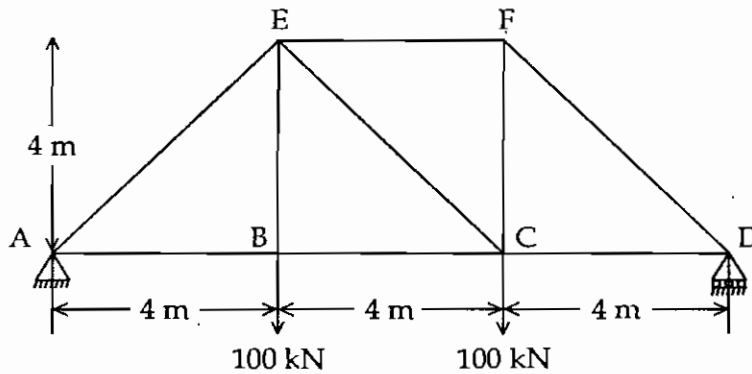


Figure No. 2 (Not to Scale)

- (b) Explain reciprocal levelling ? What is resection with reference to planet table surveying ? Explain "back ray" method of resection. 15
- (c) What is the purpose of Rate analysis ? What are the factors affected the rate analysis ? 10

Section - B

4. Answer the following sub questions :

- (a) A beam ABC supported on a column BD is loaded as shown in figure No.3. Analyse the frame by slope deflection method and draw the Bending Moment diagram. 10

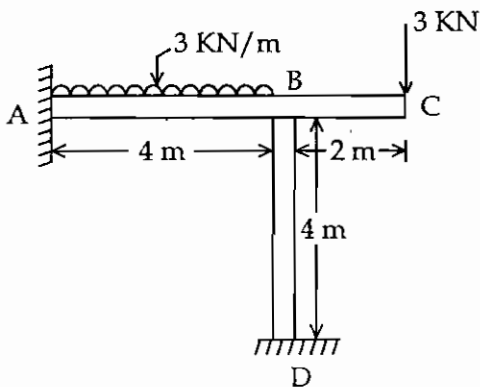


Figure No. 3 (Not to Scale)

Section - D

8. Answer the following sub questions :

- (a) Explain the Engineering importance of fault. 15
- (b) What is bridge ? Define Water Way, Afflux, Economic Span, Scour. Explain the factors to be considered while selecting the site for a proposed bridge. 15
- (c) Show the typical layout of ready mix concrete plant, keeping in mind the functioning and efficiency. Explain gabion wall or diaphragm wall. 10

9. Answer the following sub questions :

- (a) List the method of compaction of soil. Describe the utility of the sheep foot roller. 15
- (b) Speed of overtaking and overtaken vehicles are 70 kmph and 40 kmph respectively on a two way traffic road. If the acceleration of overtaking vehicle is 3.6 kmph per second,
- (i) Calculate safe overtaking sight distance.
- (ii) Mention the minimum length of overtaking zone and
- (iii) Draw a neat-sketch of overtaking zone and show the position of the sign posts. 15
- (c) What are Erection method ? Describe in brief launching method of erection. 10

- (b) A column section HB 300 @ 0.630 KN/m with one cover plate 400mm × 20mm on either side is carrying an axial load of 2800KN inclusive of self weight of base and column. Design a gusseted base. The allowable bending pressure in concrete is 4N/mm^2 . The allowable bending stress in base plate is 185N/mm^2 (MPa). 15

Assume : (i) gusset plate 16mm thick and gusset angles ISA 150mm × 115mm × 15mm.

- (ii) Shear Stress on gross area of power driven rivets 100N/mm^2 (MPa) and Bearing Stress on gross diameter of power driven rivets 300N/mm^2 (MPa).

- (c) The step of a stair of a residential building having rise of 160mm and tread of 250mm are supported at their ends by a wall on one side and a stringer beam on the other side. The distance between centre to centre of supports is 1.40m. Design the stair slab. Provide M.20 grade of concrete and HYSD steel bars of grade Fe 415. 15

5. Answer the following sub-questions :

- (a) A three hinged parabolic arch 60m span has abutment at unequal level. The highest point of the arch is at 12m and 3m from two abutment as shown in figure no.4. Find horizontal thrust and bending moment at D due to loading shown in the figure No.4. 10

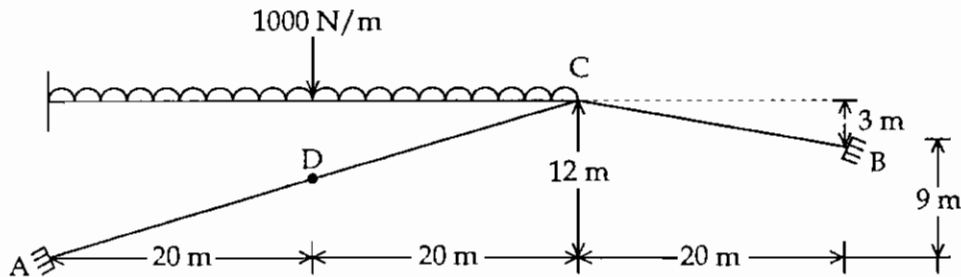


Figure No. 4 (Not to Scale)

- (b) An MB 500 @ 0.869 kN/m transmits an end reaction of 130 kN to the flange of sanction HB 250 @ 0.510 kN/m. Design a unstiffened welded seat connection from the following data angle - 150mm × 115mm × 12mm @ 0.238 kN/m Root Radius (r_1) = 11mm, $t_w = 10.2$ mm, $b_f = 180$ mm, $t_f = 17.2$ mm. Allowable bearing stress in web = $6p = 0.75f_y$ N/mm², Depth of root of fillet from extreme fibre of flange (h_2) = 37.95mm. $f_y = 250$ N/mm², $6bc = 0.66f_y$ N/mm², $f_b = 185$ N/mm². Working stress in Bearing in power driven rivet = 300N/mm² working stress in shear in power driven rivet = 100N/mm². Distance of end reaction from critical section = 3.85mm. 15
- (c) A prestressed concrete beam of rectangular cross section 400mm wide and 900mm deep is used as simple beam. Obtain the prestress and its eccentricity at midspan if $M_D = 180$ 125 Nm and $M_L = 225000$ Nm. Use concrete sections. Assume $f_{ci} = 12.5$ N/mm², $f_{cc} = 11.0$ N/mm² and $f_{ti} = f_{ctf} = 1$ N/mm² and $\alpha = 0.80$. 15

Section C

6. Answer the following sub questions :

- (a) What do you understand by governing of hydraulic turbines ? Explain with sketches the working of an oil pressure governor. 15
- (b) What is break point chlorination ? And under what conditions is it advocated ? Explain the term composting. Give the different types of composting in use and describe. 15
- (c) State the classification of dams according to hydraulic design and use. Explain the section of a particular type of dam. 10

7. Answer the following sub questions :

- (a) Describe most economical or most efficient section of channel. Derive most economical section for rectangular channel section. Explain hydraulic Jump and its applications. 15
- (b) Define air pollution. What are the effect of air pollution ? Discuss in brief cyclone collector equipment. 15
- (c) What are types of river training works ? Explain guide bank system and pitched islands with neat sketches. 10