

Serial No.

0263

AE

## CIVIL ENGINEERING

Paper-I

(Conventional)

Time Allowed : Three Hours

Maximum Marks : 200

### INSTRUCTIONS

*Please read each of the following instructions carefully before attempting questions :*

*Candidates should attempt FIVE questions in all. Question No. 1 is compulsory. Out of the remaining FIVE questions attempt any FOUR.*

*All questions carry equal marks. The number of marks carried by a part of a question is indicated against it.*

*Answers must be written in ENGLISH only.*

*Unless otherwise mentioned, symbols and notations have their usual standard meanings.*

*Assume suitable data, if necessary and indicate the same clearly.*

*Neat sketches may be drawn, wherever required. All parts and sub-parts of a question are to be attempted together in the answer book.*

*Any pages left blank in the answer book must be clearly struck out.*

*Use of IS 456 : 2000, IS 800 : 2007 and steel table is allowed.*

1. (a) Enumerate the qualities of good bricks.
- (b) What are the various defects in timber?
- (c) What is the importance of water-cement ratio for making durable and high strength concrete?
- (d) Explain the role of super plasticizer as an admixture in concrete.
- (e) How fineness of cement is determined? What is its role in the strength of cement?

8×5=40 Marks

2. (a) Due to architectural consideration the size of the simply supported beam is restricted to 250 mm × 400 mm. It carries a superimposed load of 35 kN/m over a span of 6m. Use limit state method to find out the requirement of the reinforcement in the beam. Use M25 concrete and Fe415 steel.

20 Marks

- (b) A pretensioned beam 250 mm wide and 300 mm deep is prestressed by 12 wires each of 7 mm diameter stressed to 1200 N/mm<sup>2</sup> with their centroids located 100mm from the soffit. Estimate the final percentage loss of stress due to elastic deformation, creep, shrinkage and relaxation. Use following data:

Relaxation of steel stress = 90 N/mm<sup>2</sup>

$E_s = 210 \text{ kN/mm}^2$ ,  $E_c = 28 \text{ kN/mm}^2$

**Haier**  
 MODEL: HS  
 Split type room air  
 Power supply: 1  
 Air volume  
 Anti-electric shock  
 Net weight  
 Manufacture date  
 0010531066

Creep coefficient ( $\phi$ ) = 1.6

Residual shrinkage strain =  $3 \times 10^{-4}$

20 Marks

3. (a) In a roof truss, a tie member ISA 80 mm  $\times$  50 mm  $\times$  8 mm carries a tension load equal to the full strength of the member. The tie is connected to a gusset plate 8 mm thick. Design the welded joint. Yield strength of steel is 250 MPa and shear stress in weld is 108 MPa.

The relevant properties of the angle sections are,

$A = 978 \text{ mm}^2, C_{xx} = 27.3 \text{ mm}$

20 Marks

- (b) Design a suitable built up section using two channels for a steel column to carry an axial load of 1200 kN. The effective length of column is 6.0 m. Properties of ISMC 350:

$A = 5366 \text{ mm}^2, I_x = 100.08 \times 10^6 \text{ mm}^4, I_y = 4.306 \times 10^6 \text{ mm}^4, C_x = 24.4 \text{ mm}$ , width of flange = 100 mm,

Permissible stress in axial compression of steel = 260 N/mm<sup>2</sup>:

Slenderness ratio ( $\lambda$ )	40	50	60	100	110	120	130	140	150
Permissible Stress in N/mm <sup>2</sup>	145	136	126	82	73	64	57	51	46

20 Marks

4. (a) A project schedule has the following characteristics

Activity	Duration in weeks		
	Optimistic	Most likely	Passimistic
1-2	7	11	13
2-3	1	4	7
2-4	10	15	48
3-5	12	20	26
3-6	4	7	16
3-7	4	7	16
6-7	5	8	11
4-7	2	8	14
7-8	9	12	15
8-9	1	4	7

- i. Draw the network diagram and mark critical path.
- ii. Find the expected time, standard deviation and variance of each activity.
- iii. What is the expected time of completion of the project?
- iv. What is the probability of completion of the project in 34 weeks?
- v. What is the probability of the activity 3-7 being completed in the twentieth week?

4×5=20 Marks

- (b) List out the basic parts and operations of a Hoe and state its applications 10 Marks
- (c) Differentiate between PERT and CPM of project planing. 10 Marks
5. (a) A rigid bar AB is hinged at A and supported by bronze rod GD of length  $2L$  and steel rod FC of length  $L$ . A load  $P$  is applied at the end B as shown in Fig. 1. Calculate the load carried by each rod and reaction at A. Take area of steel rod as 1.5 times the area of bronze rod, modulus of elasticity of steel as 2 times the modulus of elasticity of bronze.

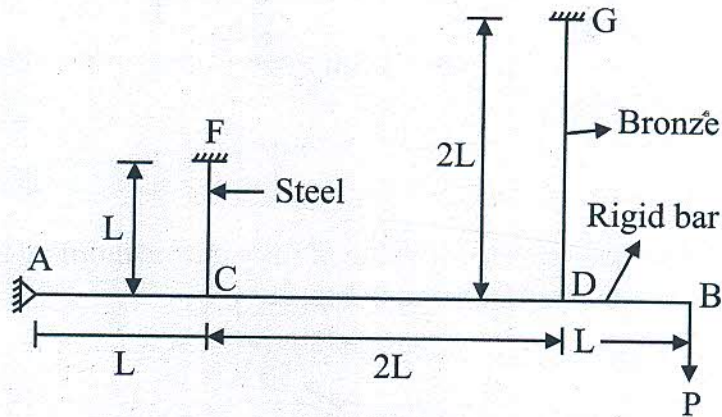


Fig. 1

20 Marks

- (b) The load on a bolt consists of an axial pull of 15 kN together with a transverse shear of 7.5 kN. Determine the diameter of the bolt according to
- i. Maximum principal stress theory
  - ii. Maximum shear stress theory
  - iii. Maximum principal strain theory

- iv. Maximum strain energy theory
- v. Maximum shear strain energy theory

4×5=20 Marks

6. (a) Analyse the beam loaded as shown in Fig. 2 using slope deflection method. Portion AB has a second moment of area as  $1.5I$  and BC has this value as  $I$ . Draw the bending moment and shear force diagrams.

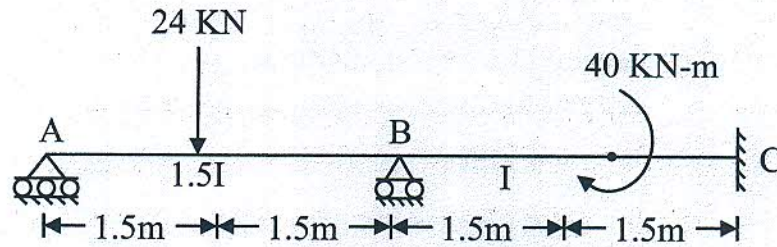


Fig. 2

20 Marks

- (b) Determine the value of fully plastic moment  $M_p$  for the frame shown in Fig. 3.

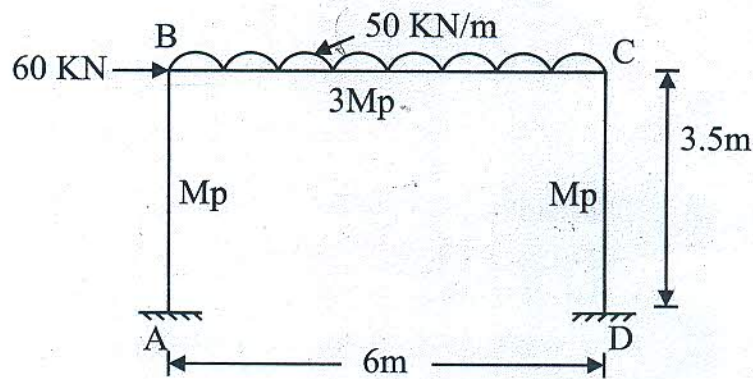


Fig. 3

20 Marks