Total No. of Printed Pages – 6

AEUD

CIVIL ENGINEERING

PAPER – I
SUBJECT CODE : 08

Full Marks : 200 **Time : 3 Hours**

Instructions For Candidates :

Please read each of the following instructions carefully before attempting questions.

(1) *Answers must be written in **ENGLISH** only.*

(2) *The question paper contains a total of 8 questions in **TWO** Sections : Section-A and Section-B. (**FOUR** questions in each section)*

(3) *Question No. 1 of Section 'A' and Question No. 5 of Section 'B' are **compulsory**.*

(4) *Candidates have to attempt another **THREE** questions from remaining **SIX** questions choosing atleast **ONE** question from each section.*

(5) *Assume suitable data if found necessary.*

(6) *Wherever any assumption be made for answering a question, they must be clearly indicated.*

(7) *Marks carried by a question / section is indicated against it.*

(8) *Unless struck off, attempt of question shall be counted even if attempted partly.*

(9) *Any page or portion of the page left blank in the Answer Booklet must be clearly struck off.*

SECTION – A

Marks

1. (i) Write short notes on : **8**

   (a) Defects in timber

   (b) Ply wood

   (c) Seasoning of timber

   (d) Preservation of timber

Marks

(ii) Calculate the total elongation of a prismatic bar of length l and cross sectional area 'A' which hangs vertically under its own weight. **8**

(iii) Analyze the continuous beam shown in Fig. 1 (iii) by Moment Distribution Method and find the Moment at various points A, B and C. **8**

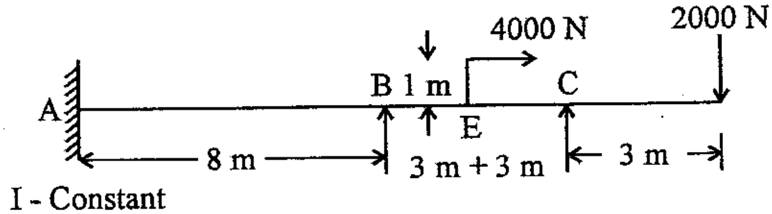

Fig. 1 (iii)

(iv) Find the centroid of a 120 mm x 150 mm x 20 mm T section. **8**

(v) State the Muller Breslau principle and its applications. **8**

2. (i) What is rapid hardening cement ? What is its significance ? How does it differ from ordinary Portland cement ? **15**

(ii) Find the deflection at free end of a cantilever beam of length l, loaded with triangular load, w per unit length at fixed end and zero at free end. **10**

(iii) A solid shaft of aluminum of length 1.5 m and of 60 mm diameter is to be replaced by a tabular steel shaft of the same length and the same outside diameter, such that each of two shafts have the same angle of twist per unit torsional moment over the total length. Determine the inner diameter of the tubular steel shaft, if the modulus of rigidity of steel is three times that of aluminum. **15**

3. (i) Explain various ingredients of brick earth work and state different types of bricks as per Indian Standard code ? **10**

(ii) A timber beam of rectangular section is to support a load of 25 kN (uniformly distributed) over a span of 4 m. If the depth of the section is to be twice the breadth, and the stress in the timber is not to exceed 50 N/mm^2, find the dimensions of the cross section.

How the cross-section of the beam would be modify if it were a concentrated load placed at the centre with the same ratio of breadth to depth. **20**

Marks

(iii) Find the collapse load factor for the fixed beam (fixed at both end) of length l loaded with uniformly distributed load of w/unit length all over the span. Fully plastic moment of section is M_p. **10**

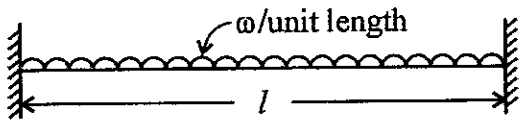

Fig. 3 (iii)

4. (i) A Continuous beam ABC is simply supported at A, B and C as shown in Fig 4 (i). The support C is yielding and settles at the rate of 3 mm per 1000 kg. $EI = 8 \times 10^{10}$ kg-cm^2. Analyze the beam and draw bending moment and shear force diagrams. **30**

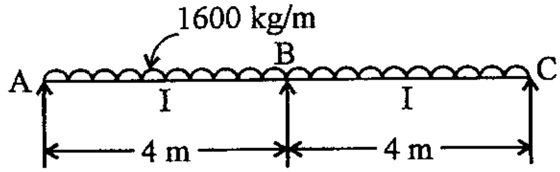

Fig. 4 (i)

(ii) Show that for a rectangular section, the distribution of shearing stress is parabolic. **10**

SECTION – B

5. (i) Determine the rivet value of 20 mm diameter rivets connecting 10 mm plate and is in (a) single shear and (b) double shear. The permissible stresses for rivets in shear and bending are 80 MPa and 250 MPa respectively and for plate in bearing is 250 MPa. **8**

(ii) The one-way slab of a reading room is estimated to have a thickness of 100 mm along with thickness of finishing as 75 mm. The slab is to carry a live load of 4 kN/m^2. Determine the factored loads (a) for strength, and (b) for serviceability limit states. Take Unit weight of concrete as 25 kN/m^3 and finishing as 22 kN/m^3. **8**

Marks

(iii) Calculate the strength of ISA 40 × 25, 6 mm thick when used as a tension member with its longer leg connected by

(a) 14 mm diameter rivets

(b) Fillet weld 8

(iv) Design a balanced singly reinforced concrete beam section for an applied moment of 60 kN-m. The width of the beam is limited to 175 mm. Use M20 grade of concrete and Fe 415 steel bars. 8

(v) Following data pertains to a project network. Draw the network, compute project duration and indicate the critical path. 8

Activity	A	B	C	D	E	F	Dummy	G
Dependence on	-	-	A	A	C	C	D, E	B, Dummy
Duration, days	6	12	10	10	4	8	-	9

6. (i) Determine the size of the bolts required to connect the bracket to the column shown in Fig. 6 (i). All linear dimensions in the Fig 6 (i) are in mm. 20

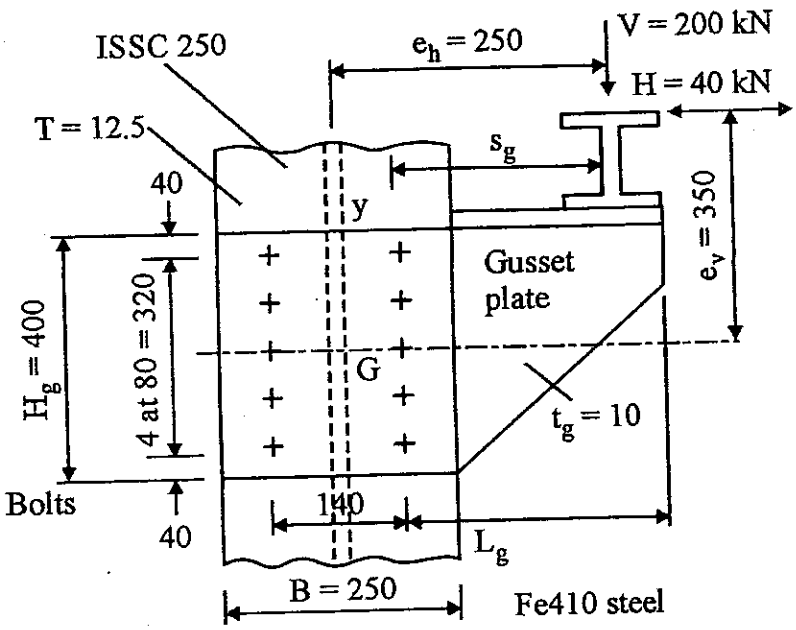

Fig. 6 (i)

Marks

(ii) A circular column, 4.6 m high is effectively held in position at both the ends and restrained against rotation at one end. Design the column, to carry an axial load of 1200 kN, if its diameter is restricted to 450 mm. Use M20 grade of concrete and Fe 415 steel. **20**

7. (i) Determine the design tensile strength of plate (160 mm × 8 mm) connected to 10 mm thick gusset plate using 16 mm bolts as shown in Fig. 7(i) . If the yield and ultimate stress of the steel are 250 MPa and 410 MPa respectively, for following case

(a) Gross section yielding

(b) Net section rupture **20**

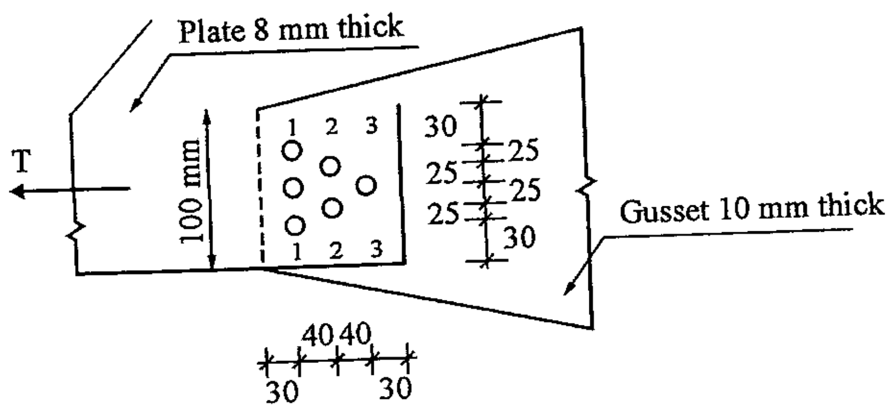

Fig. 7 (i)

(ii) A rectangular concrete beam 150 mm wide and 300 mm deep is prestressed by a straight cable carrying an effective prestressing force of 225 kN at an eccentricity of 50 mm. The beam supports a uniformly distributed load of 7.2 kN/m inclusive of the self weight of the beam. Span of the beam is 5 m. If the modulus of rupture of concrete is 5 N/mm^2, calculate the load factor against cracking. **20**

Marks

8. (i) Draw the network of the following activities. Indicate the critical path. Node (1) denotes start and Node (5) denotes end. Calculate total float, free float and independent float values . 25

Activity	Duration (Days)	Dependence (upon)
1 – 2	3	none
1 – 3	5	none
2 – 4	4	1 – 2
4 – 5	5	1 – 3, 2 – 4
3 – 5	8	1 – 3

(ii) Name the different concreting equipment. Write the purpose of any two equipment. 15