Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 02

Total No. of Questions : 18

B.Tech. (Civil Engineering)   (Sem.–5)
STRUCTURAL ENGINEERING
Subject Code : BTCE-505-18

M.Code : 78464

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

Answer briefly :

1) What are laterally supported and unsupported beam.

2) Define Castiglano's theorem.

3) Define HYSG bolts.

4) a) What is the significance of ILD.

   b) Define Characteristic strength.

5) How many number of reactions are required for the stability of 2D structures?

6) Why lacings are provided in columns.

7) What is static indeterminacy?

8) Draw ILD for support reactions at a distance 'x' from left end of a simply supported beam of length 'L' when a unit load moves from left end to right end.

9) As per IS: 456-2000, in how many grades concrete is designated. What do you mean by M20 concrete?

10) Difference between column and strut.

SECTION-B

11) Design a butt joint to connect two plates 240×12 mm ($fy = 230$ N/mm^2) using ordinary M20 bolts. Arrange the bolts to give maximum efficiency.

12) Calculate moment of resistance of RCC beam 300mm $\times$ 500mm reinforced with 4 bars of 20 mm diameter of Fe415 steel. Use M20 concrete.

13) What is the role of Structural engineer in Structural Engineering?

14) Design a rectangular beam for simply supported span of 6.1m, carrying a superimposed load of 28 kN/m inclusive of its self weight. Use M20 concrete and Fe415 steel. Take width of beam as 300 mm.

15) Difference between one way and two way slab.

SECTION-C

16) Design a slab over a room 8m $\times$ 4m as per IS code. The edges of the slab are simply supported and corners are not held down. Take live load as 3.2 kN/m^2. The slab has a bearing of 180mm on the supporting walls. Use M20 concrete and Fe415 steel.

17) Design a built up column 9.8m long to carry an axial load of 730 kN. The column is restrained in position but not in direction at both the ends. Provide single lacing system with riveted connections. Assume $fy = 250$ MPa.

   a) Design the column with two channels placed back-to-back.

   b) Design the column with two channels placed toe-to-toe.

18) Design a beam of 5.5m effective span, carrying a uniform load of 20 kN/m if the compression flange is laterally supported. (Assume $fy = 250$ N/mm^2)

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.