

Total number of printed pages-3

43 (ARC-5) 5.5

2018

**STRUCTURE-V**

Paper : ENG 5.5

Full Marks : 100

Time : Three hours

**The figures in the margin indicate full marks for the questions.**

1. (a) Differentiate long column and short column.  
(b) Design a short column having an axial load of 1000kN. Consider M20 grade concrete and Fe 500 grade steel.  
5+15=20
2. (a) What are dead loads, live loads and earthquake loads?  
(b) Discuss the classification of columns according to materials of construction and shape of column. 5+15=20

Contd.

3. (a) What are the assumptions made in the Limit State Method (LSM) of design?
- (b) Explain briefly the philosophy behind limit state method and working stress method of design.
- (c) Write down the different load combinations for —  $5+10+5=20$
- (i) Limit state of serviceability
- (ii) Limit state of collapse.

4. Answer the following questions:  $5 \times 4 = 20$

- (a) State *three* differences between one-way slab and two-way slab.
- (b) Describe in detail under-reinforced and over-reinforced sections.
- (c) What is water-cement ratio? How it affects —
- (i) Workability and
- (ii) Strength of concrete?

What is the water-cement ratio of M20 grade concrete?

- (d) Write the procedure for design mix of concrete.

5. (a) Write down the IS recommendations for longitudinal reinforcements in a beam.
- (b) A single reinforced beam section  $250 \times 450$  is having  $3-20\phi + 2-16\phi$  rebars (where  $\phi$  = diameter of bar). Considering M25 grade concrete and Fe415 grade steel, determine whether the section is under-reinforced or over-reinforced.  $5+15=20$

6. Design a rectangular column footing for an axial load  $600 \text{ kN}$  for a column of size  $400 \times 600$  (in mm). The safe bearing capacity of the soil is  $120 \text{ kN/m}^2$ . Use M20 grade of concrete and Fe415 grade of steel. Draw longitudinal section showing all dimension and reinforcement details.  $20$

7. Design a simply supported two-way slab of size  $3 \text{ m} \times 4 \text{ m}$  and total load over the slab is  $3 \text{ kN/m}^2$ . Use M20 grade of concrete and Fe415 grade of steel. Show detailed reinforcement arrangement in plan and elevation.  $20$