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No. of Printed Pages : 3 **ET-508 (A)**

# B.TECH. CIVIL (CONSTRUCTION MANAGEMENT)/ B.TECH. CIVIL (WATER RESOURCES ENGINEERING)

## Term-End Examination, 2019

## ET-508(A) : STRUCTURAL DESIGN-I

**Time : 3 Hours]** **[Maximum Marks : 70**

**Note :** Answer **any four** questions. All questions carry equal marks. Use of IS : 456 and scientific calculator is permitted. Assume missing data suitably.

1. Find the moment of resistance of a beam 250 mm × 500 mm deep, if it is reinforced with 2-12 mm dia bars in compression zone and 4-20 mm dia bars in tension zone, each at an effective cover of 40 mm, as shown in figure-1. Assume M15 mix of concrete and Fe 415 grade steel. Use limit state method of design. [17½]

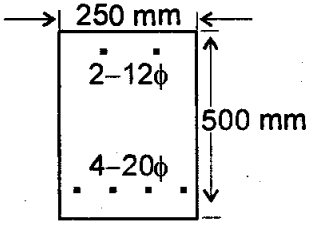

Fig.1

2. A rectangular beam is 200 mm wide and 400 mm deep upto the centre of reinforcement. Find the reinforcement required if it has to resist a factored bending moment of 60 kNm. Use limit state method of design. [17½]

3. A RCC beam, 300 mm wide and 600 mm deep, has 4 bars of 20 mm diameter as tension reinforcement, the centre of the bars being 50 mm from the bottom of the beam. Determine the uniformly distributed load (inclusive of its own weight) the beam can carry over an effective span of 6 m. Take the permissible stresses in concrete and steel as 5.2 N/mm$^2$ and 126 N/mm$^2$ respectively and modular ratio as 18. The beam is simply supported at the ends. Use working stress method of design. [17½]

4. A simply supported beam, 300 mm wide and of 500 mm effective depth, carries a uniformly distributed load of 50 kN/m inclusive of its own weight, over an effective span of 4 metres. Design the shear reinforcement in the form of vertical stirrups. Use M15 concrete. Take 6st =6sv = 140 N/mm$^2$ and $f_y$ = 250 N/mm$^2$. Assume that the beam contains 0.75% reinforcement throughout the length. Use working stress method of design. [17½]

5. A reinforced concrete column 2.8 m long (effective) and 240 mm × 240 mm in section is reinforced with 4-20 mm diameter bars. Find the safe load the column can carry. Assume 6 cc = 4 N/mm² and 6sc = 130 N/mm². Use working stress method of design. [17½]

6. Show that for yield line analysis of simply supported one way slabs

$$w = \frac{8M_0}{L^2}$$

where all the terms have their usual meanings. [17½]

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