

Code No: RT32355

**R13****SET - 1****III B. Tech II Semester Supplementary Examinations, November - 2017****THEORY OF STRUCTURES**

(Agricultural Engineering)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)2. Answering the question in **Part-A** is compulsory3. Answer any **THREE** Questions from **Part-B**

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**PART -A**

- 1 a) What is moment of resistance in a beam? Write the governing formula in case of single reinforced beam. [3M]
- b) Explain the modular ratio for compression steel. Write the expression. [4M]
- c) What are the three forms in which the shear reinforcement is provided? [3M]
- d) Draw the schematic diagram of a 'T' beam and label its dimensions. [4M]
- e) Differentiate between short and long columns. [4M]
- f) Classify foundations. What is raft foundation? [4M]

**PART -B**

- 2 a) Write the properties and advantages of RCC. [4M]
- b) Find the position of neutral axis of a beam 25 cm wide and 40 cm deep. The cover of concrete to the centre of main reinforcement is 4 cm. The stresses in concrete and steel may be taken as 5 and 140 N/mm<sup>2</sup> respectively. Take m=19. [8M]
- c) What are the assumptions based on which the elastic theory is applied to beams? [4M]
- 3 a) A beam 250 mm × 500 mm in section is reinforced with 2 bars of 16 mm diameter at top and 4 bars of 22 mm diameter at the bottom each at an effective cover of 380 mm. If safe stresses in the materials are 5 MPa and 140 MPa respectively, find the stress in concrete surrounding compression steel. Take m=19. [8M]
- b) Derive an equation for the shear stress induced in RC beam. [8M]
- 4 a) Discuss 'anchoring bars in tension' along with sketches. [8M]
- b) A simply supported RC beam has an effective depth of 40 cm and carries a uniformly distributed load of 1200 kg/m over a clear span of 5.6m. The beam is reinforced with 6 number of 18 mm diameter bars at the mid span. If the permissible bond stress is to be limited to 10 kg/cm<sup>2</sup>, find the distance from the supports where bars can be bent up in pairs for resisting shear without exceeding the stress in steel beyond 1400 kg/cm<sup>2</sup>. [8M]
- 5 Design a floor slab simply supported over a clear span of 3 m. The slab is to be finished with 25 mm thick cement concrete flooring. The super-imposed load on the slab is to be 3500 N per square meter. The bearing of the slab on the supporting walls may be taken as 230 mm. Adopt M 15 grade of concrete and mild steel reinforcement. [16M]  
Assume  $\sigma_{cbc} = 5 \text{ N/mm}^2$ ,  $\sigma_{st} = 140 \text{ N/mm}^2$ , 'm'=19, neutral axis factor 'k'=0.404, and lever arm factor 'j'=0.865. Also assume the diameter of main and distribution bars as 10 and 6 mm respectively.

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- 6 a) Design a short circular RC column to carry an axial load of 388 kN. The column is to be provided with circular lateral ties. Adopt M20 grade of concrete and mild steel reinforcement. [8M]
- b) In a two way slab, how the bending moments along long and short spans are determined as per Marcus's method? [8M]
- 7 a) A rigid retaining wall, 6 m high is restrained from yielding. The back fill consists of cohesion less soil having angle of internal friction  $26^\circ$  and unit weight of  $19\text{kN/m}^3$ . Compute the total earth pressure per meter length of the wall. [8M]
- b) Write the step wise procedure involved in the design of RCC footing for concrete wall. [8M]

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