

510303

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B. Tech. V - Sem. (Main) Exam., December - 2020

Civil Engineering

5CE4 – 03 Design of Concrete Structures

Time: 3 Hours

Maximum Marks: 120

Min. Passing Marks:

Instructions to Candidates:

Part – A: Short answer questions (up to 25 words) 10×2 marks = 20 marks.
All ten questions are compulsory.

Part – B: Analytical/Problem solving questions 5×8 marks = 40 marks.
Candidates have to answer five questions out of seven.

Part – C: Descriptive/Analytical/Problem Solving questions 4×15 marks = 60 marks.
Candidates have to answer four questions out of five.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. IS 456 : 2000

2. NIL

PART – A

Q.1 What is the formula used to find the critical neutral axis in working stress method?

Q.2 Enumerate the advantages of flanged beams.

Q.3 What is the necessity of providing combined footings?

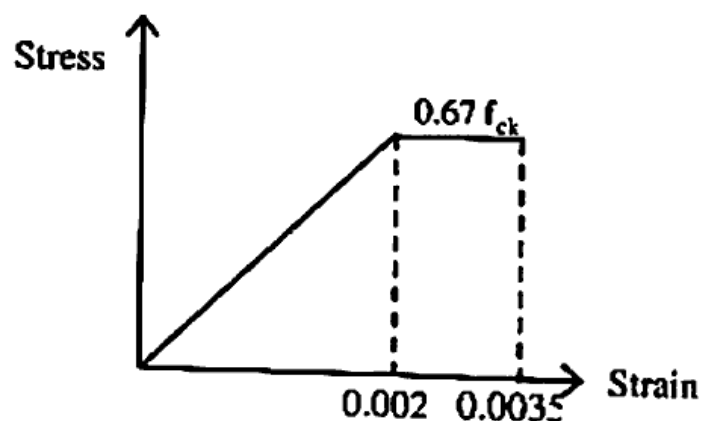
Q.4 Differentiate between under reinforced and over reinforced section.

Q.5 How the compression failures occur in columns?

- Q.6 What is anchorage length and development length?
- Q.7 Draw a typical labelled sketch of a flat slab and discuss its salient features.
- Q.8 Explain merits of limit state method and demerits of working stress method.
- Q.9 Give some examples for structural elements, which will be subjected to torsional moment.
- Q.10 What do you understand by development length of bar?

PART – B

- Q.1 A rectangular concrete section of 300 mm width and 500 mm effective depth is reinforced with 3 bars of grade Fe-415 each of 16 mm diameter and concrete mix is M-20. Assume straight line instead of parabola for stress strain curve of concrete as follows and partial factor of safety as 1.0.



Determine the depth of neutral axis from the compression fibre.

- Q.2 Derive the expression for the depth of neutral axis and moment of resistance of a rectangular singly reinforced balanced beam section under flexure.
- Q.3 Sketch the standard detailing of two span one-way continuous slab with curtailment details.

- Q.4** A rectangular singly reinforced concrete beam with cross section 300 mm × 500 mm is simply supported over the clear span of 5 m with support of 250 mm each. Calculate ultimate moment of resistance of the beam using Limit State method. Use M20 grade of concrete and Fe – 415 grade of steel.
- Q.5** A short column 30 cm × 30 cm section is reinforced with 8 bars of 22 mm diameter. Find the safe load on column as per the T.S. Code permissible stresses in concrete and steel are 4 N/mm² and 130 N/mm² respectively. <https://www.btubikaner.com>
- Q.6** A reinforced concrete beam is 350 mm × 600 mm is subjected to a bending moment of 135 kN-m. Determine the area of reinforcement if M20 concrete and Fe-415 steel is used. Take effective cover as 40 mm. Use Limit State method.
- Q.7** What is a Doubly Reinforced T-beam? Derive the expressions for finding moment of resistance for Doubly reinforced T – beam.

PART – C

- Q.1** A beam of rectangular section is reinforced with 6 nos of 18 mm diameter bars in tension and is supported on an effective span of 5 m, the beam being 300 mm wide and 700 mm deep. The beam carries a uniformly distributed load of 42 kN/m. Design the shear reinforcement considering no bar are bent up for shear. Assume $\sigma_{sv} = 230 \text{ N/mm}^2$, $\tau_c = 0.30 \text{ N/mm}^2$ and $f_y = 415 \text{ N/mm}^2$.
- Q.2** A simply supported slab of a corridor of a hospital building has a clear span 2.5 m and is supported on beam 230 mm width. Design the slab, if the beam is carrying a live load of 5 kN/m². Use M20 concrete and HYSD Fe- 415 steel bars. Assume suitable data if required.

Q.3 Determine the cross section and the reinforcement for an axially loaded column with the following data –

- (i) Factored load- 3000 kN
- (ii) Concrete – M20
- (iii) Characteristic strength of reinforcement – 415 N/mm²
- (iv) Unsupported length of the column – 3 m.

Q.4 Design a two way slab for the following data : size = 7m × 5m, width of the support = 300 mm, Edge condition = two short edges are discontinuous, live load = 5kN/m², floor finish as 1kN/m². Use M20 concrete and Fe – 415 steel.

Q.5 A doubly reinforced concrete beam 250 mm wide and 600 mm deep overall has to resist an external bending moment of 195kN-m. Find the amount of tensile and compressive steel required, if the cover to the centre of steel on both sides is 50 mm. Consider limit state method for design. Use M20 grade concrete and Fe – 415 steel.

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