320512(20)

B. E. (Fifth Semester) Examination, April-May 2021

(Old Scheme)

(Civil Engg. Branch)

STRUCTURAL ENGINEERING DESIGN-I

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all questions. Part (a) from each question is compulsory. Answer worth 14 marks further from remaining parts. Assume suitable data if required and mention reason. IS Code 456 : 1984 & 456 : 2000 is permitted.

Unit-I

1. (a) Why is it necessary to provide reinforcement in concrete?   2

   (b) What are the advantages and disadvantages of using

HYSD bars in RCC structure? 7

(c) Compare the design philosophy of working stress and limit state method of design. 7

(d) What are the different factors affecting short-term deflection and long-term deflection in reinforced concrete structure. 7

Unit-II

2. (a) In which condition a doubly reinforced beam will be provided. 2

(b) A rectangular, singly reinforced beam, 300 mm wide and 500 mm effective depth is used as a simply supported beam over an effective span of 6 m. The reinforcement consists of 4 bars of 20 mm diameter. If the beam carries a load of 12 kN/m. inclusive of the self-weight, determine the stresses developed in concrete and steel. Take $m = 19$. 7

(c) An RCC slab has to be provide over a room 4 m × 5 m. The slab is continuous over two adjacent supports and discontinuous at the other two supports. The live load on the slab is 3500 N/m².

Design the slab. Use M-20 and Fe-415 steel. 7

(d) A T-Beam of effective flange width 1200 mm, thickness of slab 100 mm, width of rib 300 mm and effective depth of 560 mm is reinforced with 4 no. of 25 mm diameter bar. Calculate the moment of resistance. Use M-20 and Fe-415 steel. 7

Unit-III

3. (a) What is the minimum and maximum longitudinal reinforcement at any cross section of column? 2

(b) A square column 300 mm × 300 mm is reinforced with 4 bars of 20 mm diameter, placed 35 mm from the face of column. A load of 280 kN is applied at an eccentricity of 35 mm, from one of its axis, find the stress induced in column. Apply check. Use working stress method. 7

(c) Design a short RC column to take an axial load of 4000 kN. The size of the column is not to be more than 700 mm. Use spiral reinforcement. Mix of concrete is to be used is M-25. Use Fe-415 steel. 7

(d) Give for specification regarding reinforcement in a

column.   7

Unit-IV

4. (a) What are the various forms of providing shear reinforcement in beam?   2

(b) Design a cantilever beam having an effective span of 3 m. The beam is carrying a load of 14kN/m including its own weight. Use M-20 concrete and Fe-415 steel. Check for shear and deflection also. Use limit state method.   14

(c) Design a slab over a room 4.5 m × 5 m. The slab is supported on masonry walls all round with adequate resistant and the corners are held down. The live load on the slab is 2500 N/m². The slab has bearing of 150 mm on the supporting walls. Use M-20 concrete and Fe-250 steel. Use limit state method.   14

Unit-V

5. (a) Explain mode of failure considered in limit state design.   2

(b) Design a reinforced concrete column 350 mm square to carry a load of 1200 kN. Use M-20 concrete and Fe-415 grade steel. Adopted limit state method of design.   14

(c) A square column 400 mm × 400 mm carries an axial load of 1500 kN. Design the column and a square footing for the column by limit state method. The safe bearing capacity of the soil is 150 mm². Use M-20 concrete and Fe-250 steel.   14