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C020511(020)

B. Tech. (Fifth Semester) Examination, Nov.-Dec. 2021

AICTE

(~~New~~ Scheme)

(Civil Engg. Branch)

STRUCTURAL ENGINEERING DESIGN-I

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Attempt all question. Part (a) from each question is compulsory and carries 4 marks. Attempt any two questions from Part (b), (c) and (d) parts of each unit and carris 8 marks each question. IS: 456-2000 is permitted. Assume suitable data whenever necessary.*

Unit-I

1. (a) What are the properties of concrete? Describe any three properties in details. 4

(b) The coss-section of singly reinforced beam is 230 × 450 mm to the center of tension steel which consists of 3 bars of 16 mm diameter. Determine the moment of resistance of the beam. Use WSM. 8

(c) Determine the moment of resistance of the beam, using working stress method, whose section is 300 × 900 mm and reinforced with 2 bar of 16 mm diameter at top and 4 bars of 20 mm diameter at bottom. Take effective cover as 50 mm for tension and compression steels. 8

(d) A beam 300 × 600 mm effective dimensions is provided with tension and compression reinforcement of 1000 mm^2 each. The effective cover to both these reinforement is 25 mm. Find out the moment of resistance of this section, using working stress method. 8

Unit-II

2. (a) Difference beween WSM and LSM in details. 4

(b) A RCC beam, doubly reinforcement is 300 mm wide & 500 mm deep. Find area of tension and compressive reinforement if it is subjected to (unfactored) total bending moment of 250 kN-m

take cover to center of top and bottom reinforcement as 40 mm us LSM method. 8

(c) A doubly reinforcement concrete beam has 350 × 750 mm. Area of steel in tension = 4 nos., 22 mm diameter and area of steel in compression = 4 nos., 16 mm diameter of Fe-415 steel. Design the beam if it subjected to a super imposed moment of 400 KN-m (unfactored). Take the cover of top and bottom reinforcement as 50 mm. 8

(d) Find the moment of resistance of a singly reinforced concrete beam of 200 mm width and 400 mm effective depth. If it is reinforcement with (i) 4 bars with 16 mm diameter (ii) 3 bars with 16 mm diameter. 8

Unit-III

3. (a) Explain important IS 456:2000 recommendations for effective span of slab and control of deflection. 4

(b) Design one of the flights of stair of a school building spanning between landing beams to suit the following data : 8

Type of staircase = waist slab type

Number of steps in flight = 12

Live load	=	15 kN/m
Tread	=	300 mm
Riser	=	160 mm
Width of landing beams	=	400 mm

Materials M-20 concrete and Fe-415 HYSB Bars.

(c) Design a simply supported concrete slab for a room having inside dimension of 3 m × 7 m, the thickness of supporting wall is 300 mm. The slab carries 75 mm thick flooring of unit weight 20 kN/m^2. The live load on the slab is 2 kN/m^2. Check for shear development length and anchorage at ends is not required. 8

(d) Find moment of resistance of a R.C.C. T-Beam with the following data. Width of flange 750 mm, depth of flange 125 mm, width of web 250 mm, effective depth from top of flange up to centre of reinforcement 500 mm. Area of tension reinforcement 1600 mm^2. 8

Unit-IV

4. (a) What is column? How will you differentiate short and long column? 4

(b) What do you mean by effective length of column? Explain in details. 8

(c) Design a short axially loaded column 500 mm × 500 mm for a load of 2000 kN. 8

(d) A diameter of a helically reinforced short column is 300 mm and it is reinforced with 8 nos of 20 mm diameter bars. The cover up to outside of longitudinal reinforcement is 40 mm. Helical reinforcement consists of 8 mm diameter steel at a pitch of 30 mm. Find the safe axial load on the column. 8

Unit-V

5. (a) What do you mean by footing? Explain types of footings. 4

(b) Design an isolated footing of uniform thickness of R.C. Column bearing a vertical load of 600 kN and having a base size 500 × 500 mm, the safe bearing capacity of soil may be taken as 120 kN/m^2. Use M-20 and Fe-415. 8

(c) Discuss the design steps for column footing. 8

(d) A reinforced column 400 mm × 400 mm support

on axial service load of 1,000 kN. The safe bearing capacity of soil is 200 kN/m^2. M-20 and Fe-415 used. Design the suitable footing and sketch the reinforcement placement. 8