15CV51

Visvesvaraya Technological University, Belagavi

MODEL QUESTION PAPER

5th Semester, B.E (CBCS) CV

Course: 15CV51 – Design of RC Structural Elements

Time: 3 Hours **Max Marks: 80**

Note: (i) Answer Five full questions selecting any one full question from each Module.
(ii) Question on a topic of a Module may appear in either its 1st or 2nd question.
III) Use of IS 456- 2000 and SP -16 is Permitted.

Module 1			
1	(a)	Differentiate between working stress method and limit state method of RCC design.	5
	(b)	Explain the following i)Partial safety factor for loads and materials ii)Characteristics load iii)Characteristic strength	6
	(c)	Calculate the crack width directly under the bar on tension face at the location of max bending moment in the beam of b=300mm, D=600mm, off cover on comp. side (d') =37.5mm, Reinforcement -3 bars of 20mm dia bars. M=200 kN-m, Ast=1855mm^2.	5
OR			
2	(a)	Derive the expression for stress block parameter for compressive force C_u and Tensile force T_u and locate a depth of neutral axis y= 0.42 x_u from top	5
	(b)	Briefly explain under reinforced, over reinforced and balanced sections with sketch.	4
	(c)	A reinforced concrete beam of cross section 300mmx600mm overall is reinforced with 3 bars of 20mm HYDS bars of Fe415 grade on tension side with an effective cover of 50mm. compute short term deflection of the beam at mid span, consisting of service load of 20kN/m and concentrated load of 25kN at the center of span. The beam is simply supported over a span of 5m. Use M20 grade concrete and Fe415steel.	7
Module 2			
3	(a)	Define Singly reinforced beam and doubly reinforced beam. List the situation which requires the adoption of the same.	6
	(b)	A singly reinforced beam 250mmx450mm deep up to center of reinforcement Effective cover 50mm Effective span 6m using M20 concrete and Fe500 steel. Determine the central point load that can be supported in addition to self weight. When i)3-16mm dia bars ii) 3-20mm dia bars are used as reinforcement.	10
OR			
4	(a)	Determine the moment of resistance of a T-beam for the following data Breadth of the flange=740mm; Effective depth=400mm; Breadth of web=240mm; Tensile reinforcement =5-20Φ; Depth of flange =110mm: Adopt M20 grade concrete and Fe415 grade steel.	8

<table>
<tr><td></td><td>(b)</td><td>A doubly reinforced beam section is 250mm wide and 450mm deep to the centre of the tensile reinforcement. It is reinforced with 2#16Φ as compression reinforcement at an effective cover of 50mm and 4#25Φ as tensile steel. Using M15 concrete and Fe250 steel. Calculate the ultimate moment of resistance of the beam section.</td><td>8</td></tr>
<tr><td colspan="4">Module 3</td></tr>
<tr><td rowspan="2">5</td><td>(a)</td><td>A rectangular RC beam of size 250mm * 600 mm of effective simply supported span of 7 m has a support service load of 26.25 kN/m excluding self-weight. The effective cover = 50 mm Design the beam for flexure and shear. Check the beam depth for control of deflection using empirical method. Design the stress value for different strain in steel is given below
<table>
<tr><th>Strain</th><th>Stress (N/mm2)</th></tr>
<tr><td>0.00276</td><td>351.8</td></tr>
<tr><td>0.00380</td><td>360.9</td></tr>
</table></td><td>9</td></tr>
<tr><td>(b)</td><td>A reinforced concrete beam is to be designed over an effective span of 5m to support a service load of 8 kN/m . Adopt M20 grade concrete and Fe 415 steel. Design a beam to satisfy the collapse and serviceability limit states.</td><td>7</td></tr>
<tr><td colspan="4">OR</td></tr>
<tr><td rowspan="2">6</td><td>(a)</td><td>A hall of 16 m * 6m supported by beams spaced 4 m C/C thickness of slab is 120 mm UDL 4 kN/m .Design a T beam using M20 Concrete and Fe 415 steel for flexure and shear . Take bearing as 500 mm. Also show check for deflection and bond</td><td>8</td></tr>
<tr><td>(b)</td><td>A doubly reinforced concrete beam 250 mm wide 500mm deep is required to support 40 kN/m including self-weight with effective span 5m .Effective cover of 50 mm using M20 concrete and Fe 415 steel find steel for flexure and shear</td><td>8</td></tr>
<tr><td colspan="4">Module 4</td></tr>
<tr><td rowspan="3">7</td><td>(a)</td><td>Distinguish between one way slab and Two way slab</td><td>4</td></tr>
<tr><td>(b)</td><td>Explain Importance of Bond , Anchorage length</td><td>4</td></tr>
<tr><td>(b)</td><td>Design a slab for a room 5m x 10m live load 4kN/m^2. Use M20 concrete and Fe415 steel. Also check for bond length deflection and shear. Assume corners are held down, bearing 300mm. Sketch the reinforcement details.</td><td>7</td></tr>
<tr><td colspan="4">OR</td></tr>
<tr><td></td><td>(a)</td><td>What is development length? Obtain the expression for development length in tension?</td><td>3</td></tr>
<tr><td rowspan="2">8</td><td>(b)</td><td>Design a two way slab 5m x 6m. Live load is 3kN/m^2. M20 concrete Fe415 steel. Also check for bond length and shear. Assume corners are held down, bearing 300mm.</td><td>6</td></tr>
<tr><td>(b)</td><td>Design the middle flight of a open well type stair case to be provided for a stair hall of size 3.25m x 3.25m. Size of open well = 1.25m x 1.25m. Floor to floor height = 3.6m. Size of landing at each corner = 1m x 1m. Stair had to be provided along all the four walls of hall. Thickness of stair hall is 230mm. the stair slab is embedded in to the wall by 200mm. The service live load is 3kN/m^2.</td><td>7</td></tr>
<tr><td colspan="4"></td></tr>
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Module 5			
9	(a)	What is necessity of transverse reinforcement in columns	3
	(b)	Design RCC column having unsupported length 2.75 m to support a load of 2000 KN using M20 concrete and Fe 415 steel	6
	(b)	A square column 400mm sides carries a load of 900kN. Design a footing SBC of soil 100kN/m2. Adopt M20 concrete Fe415 steel. Check the necessary conditions.	7
OR			
10	(a)	i) Explain difference between short column and long column ii) What are the advantages of Providing pedestal to columns	3
	(b)	A column 300mm x 400mm is to support a ultimate load of 1200kN and Mu 200kN-m. Find steel using M20 concrete Fe415 steel, assuming effective cover 50mm. Sketch the reinforcement details.	6
	(b)	Design a rectangular isolated footing of uniform thickness for a column 400 mm*600 mm to support a load of 600 kN, SBC of soil is 120 kN/m^2. Adopt M20 concrete and Fe 415 steel. Consider the size of footing 2.5 m* 2.3 m. Also check the requirement with all necessary checks	7