Model Question Paper -1 with effect from 2020-21(CBCS Scheme)

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Fifth Semester B.E. Degree Examination
DESIGN OF RC STRUCTURAL ELEMENTS

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.
02. Use of IS: 456-2000, SP-16 is permitted.
03. Assume suitable additional data, if necessary.

Module – 1			
Q.1	**(a)**	Elaborate on the philosophy and principles of Limit State Method of RCC design.	08M
	(b)	Write brief notes on: a) Partial safety factor for loads, b) Partial safety factor for materials, c) Characteristic loads, d) Characteristic strength.	12M
OR			
Q.2	**(a)**	Explain the terms: balanced, under reinforced and over reinforced sections.	06M
	(b)	A simply supported beam of rectangular section 250 mm wide by 450 mm overall depth is used over an effective span of 4m. The beam is reinforced with 3 bars of 20 mm diameter Fe-415 HYSD bars at an effective depth of 400 mm. Two hanger bars of 10 mm diameter are provided. The self weight of the beam together with the dead load on the beam is 4kN/m. Service live load = 10kN/m. Using M-20 grade concrete, compute i. Short term deflection. ii. Long term deflection according to the provisions of the Indian Standards Code IS: 456-2000.	14M
Module – 2			
Q.3	**(a)**	Derive from fundamentals the expression for the area of stress block 0.36 $f_{ck}X_u$.	08M
	(b)	A R.C. Beam of section 300mm X 550mm (overall) is reinforced with 4 bars of 16mm with an effective cover of 50 mm. The beam is simply supported over effective span of 5m. Find the maximum load carrying capacity of the beam inclusive of its self weight. Use M-20 concrete and Fe-415 HYSD bars.	12M
OR			
Q.4	**(a)**	Derive the moment of resistance equation for singly reinforced rectangular section.	10M
	(b)	A reinforced concrete beam has a support section with a width of 250mm and effective depth of 500mm. The support section is reinforced with 3 bars of 20mm diameter on the tension side. 8mm diameter 2 legged stirrups are provided at a spacing of 200mm centers. Using M-20 grade concrete and Fe-415 HYSD bars, calculate the shear strength of the support section.	10M
Module – 3			
Q.5	**(a)**	Design a reinforced concrete beam of rectangular section using the following data: Effective span = 5m, Width of beam = 250mm, Overall depth = 500mm, Live load = 37kN/m, Effective cover = 50mm, Materials: M-20 grade concrete & Fe-415 HYSD bars.	20M

OR			
Q.6	**(a)**	Design a L- Beam for an office floor to suit the following data: Clear span = L = 8m, Thickness of flange = D_f =150mm, Live load = 4kN/m^2, Spacing of beams = 3m, f_{ck} = 20N/mm^2, f_y = 415N/mm^2, Width of columns = 300mm. L- Beams are monolithic with R.C columns.	20M
Module – 4			
Q.7	**(a)**	Design a R.C slab for a room of clear size 4m x 5m. The slab is supported on walls of 300mm thickness with two adjacent edges continuous and other two edges discontinuous. Live load is 3kN/m^2. Assume floor finish as 0.6kN/ m^2. Use M-20 concrete and Fe-415 HYSD bars. Sketch the reinforcement details.	20M
OR			
Q.8	**(a)**	Design one of the flights of a doglegged staircase spanning between landing beams using following data: No. of steps = 10, Tread = 300mm, Riser = 150mm, width of landing beam = 300mm, Live load = 3.5kN/m^2, Grade of Concrete = M-20, Grade of Steel = Fe-415.	10M
	(b)	Design one of the flights of an open well staircase which consists of landing on both sides and embedded into the wall of 230mm thick for the following data: No. of steps = 6, width of landing = 1.1m, Live load = 3kN/m^2, Grade of Concrete = M-20, Grade of Steel = Fe-415.	10M
Module – 5			
Q.9	**(a)**	Design the reinforcements in a rectangular column of size 300mm x 500mm to support a design ultimate load of 500kN together with a factored moment of 200kNm. Adopt the values of f_{ck} = 20N/mm^2, f_y = 415N/mm^2.	10M
	(b)	Design the reinforcements in a circular column of diameter 400mm to support a factored load of 800kN together with a factored moment of 80kNm. Adopt M-20 grade of concrete and Fe-415 HYSD bars.	10M
OR			
Q.10		Design a footing of uniform depth for a short axially loaded column of size 300mm x 500mm. The column carries an axial service load of 800kN in compression. SBC of foundation soil is 185kN/m^2. Use M20 concrete and Fe415 steel. Sketch the reinforcement details.	20M

Table showing the Bloom's Taxonomy Level, Course Outcome and Programme Outcome				
Question		**Bloom's Taxonomy Level attached**	**Course Outcome**	**Programme Outcome**
Q.1	(a)	L1	CO1	PO1,PO2
	(b)	L1	CO1	PO1,PO2
Q.2	(a)	L1	CO1	PO1,PO2
	(b)	L2	CO1	PO1,PO2
Q.3	(a)	L1	CO2	PO1,PO2
	(b)	L2	CO2	PO1,PO2
Q.4	(a)	L1	CO2	PO1,PO2
	(b)	L2	CO2	PO1,PO2
Q.5		L4	CO3,CO4	PO1,PO2
Q.6		L4	CO3,CO4	PO1,PO2
Q.7		L4	CO3,CO4	PO1,PO2
Q.8	(a)	L4	CO3,CO4	PO1,PO2
	(b)	L4	CO3,CO4	PO1,PO2
Q.9	(a)	L4	CO3,CO4	PO1,PO2
	(b)	L4	CO3,CO4	PO1,PO2
Q.10		L4	CO3,CO4	PO1,PO2

Bloom's Taxonomy Levels	**Lower order thinking skills**		
	Remembering (knowledge):L_1	Understanding (Comprehension): L_2	Applying (Application): L_3
	Higher order thinking skills		
	Analyzing (Analysis): L_4	Valuating (Evaluation): L_5	Creating (Synthesis): L_6