Hall Ticket No. | | | | | | | | | | | Question Paper Code: ACE009

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER

B.Tech V Semester End Examinations (Regular), November – 2019

Regulations: IARE-R16

REINFORCED CONCRETE STRUCTURES DESIGN AND DRAWING

(CIVIL ENGINEERING)

Time: 3 hours **Max. Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Explain the terms balanced, over-reinforced and under-reinforced section in bending. Explain which of these should be recommended in design. **[7M]**

   (b) Calculate the moment of resistance of a existing T- beam b_f= 740 mm and effective depth d= 400 mm, width of web b_w=240 mm, D_f= 100 mm. 5 No of 20 mm dia bars is inserted in beam. Use M15 grade concrete and Fe 415 bars. **[7M]**

2. (a) Design balanced singly reinforced concrete beam section for an applied moment of 60 KN-m, the width of the beam is limited to 175 mm. use M20 concrete and Fe 415 bars **[7M]**

   (b) Design a doubly reinforced simply supported beam resting on walls of 300 mm thick & 6.5 m c/c. The beam has to carry a live load of 15 kN/m & dead load of 9 kN/m. The size of the beam is 300 mm X 500 mm and has to carry a point load of 40 kN at 2m from left support. Assume 30 mm clear cover and M25 grade concrete. **[7M]**

UNIT – II

3. (a) Under what situations do the following modes of cracking occur in reinforced concrete beams: (a) flexural cracks, (b) diagonal tension cracks, (c) flexural-shear cracks and (d) splitting cracks? **[7M]**

(b) A doubly reinforced beam of rectangular section 300mm wide x500mm overall depth is reinforced with 4 bars of 20 mm diameter on the tension face and 2 bars of 16 mm diameter on the compression face. Assume moderate exposure condition. The beam spans over 9 m. Check the deflection control if Fe 415 steel is used. Use M25 concrete. **[7M]**

4. (a) What do you understand by nominal shear stress? Write the formula for uniform formulae for rectangular section? **[7 M]**

(b) A rectangular beam 230mm wide is subjected to the following at a section **[7 M]**

1. Sagging bending moment of 25kNm.
2. Shear force of 20kN.
3. Torsional moment of 30kNm.

Use M25 and Fe-415 steel. Design a suitable section and find the reinforcement required in the section.

UNIT – III

5. (a) Design a simply supported slab to cover a hall with internal dimensions 4.0 m× 6.0 m. The slab is supported on masonry walls 230 mm thick. Assume a live load of 3 kN/m2 and a finish load of 1 kN/m^2. Use M 20 concrete and Fe 415 steel. Assume that the slab corners are free to lift up. **[7M]**

(b) Explain the difference in the behavior of one-way and two-way slabs. **[7M]**

6. (a) Write the procedure for design two way simply supported slabs **[7M]**

(b) Design continuous RC slab for a hall 6.5 m wide and 13.5 m long. The slab is supported on rcc beams, each 240 mm wide which are monolithic. The ends of the slab are supported on walls 300 mm wide. Design the slab for LL of 2 KN/m^2 assume weight of roof finishing equal to 1.5 KN/m^2 use M20 grade concrete and Fe 415 grade steel. **[7M]**

UNIT – IV

7 (a) Write the design procedure for slender columns for both braced and unbraced column. **[7M]**

(b) A concrete column of 400mm diameter, reinforced with 8 bars of 20 mm diameter bars is braced & hinged at both ends, 8 m apart. Check the safety of the column if it carries a factored axial load of 1100 kN. Use M20 grade concrete & Fe 415 grade steel. Assume d' = 60 mm. **[7M]**

8 (a) A short column, 600 mm × 600 mm in section, is subject to a factored axial load of 1500 kN. Determine the minimum area of longitudinal steel to be provided, assuming M 20 concrete and Fe 415 steel. **[7M]**

(b) Design the longitudinal and lateral reinforcement in a rectangular reinforced concrete column of size 400 mm X 300 mm subjected to a design ultimate load of 1200 kN and ultimate moment of 200 kNm with respect to major axis. Adopt M 20 grade concrete & Fe 415 steel bars. **[7M]**

UNIT – V

9 (a) Explain the design procedure for isolated footing of uniform depth. **[7M]**

(b) Design an isolated footing for a square column, 450 mm × 450 mm, reinforced with 8–25 φ bars, and carrying a service load of 2300 kN. Assume soil with a safe bearing capacity of 300 kN/m^2 at a depth of 1.5 m below ground. Assume M 20 grade concrete and Fe 415 grade steel for the footing, and M 25 concrete and Fe 415 steel for the column. **[7M]**

10 (a) Explain about the following stair cases **[7M]**

(A) A stair case

(B) A dog legged stair

(C) An open stair

(D) A geometrical stair.

(b) A straight staircase is made of structurally independent tread slabs, cantilevered from a reinforced concrete wall. Given that the riser is 150 mm, tread is 300 mm, and width of flight is 1.75 m, design a cantilevered slab using M 20 concrete and Fe 250 steel. Assume mild exposure conditions. Apply the live loads specified in the IS Loading Code for stairs liable to be overcrowded. **[7M]**

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COURSE OBJECTIVES:

The course should enable the students to:

I	Identify, formulate and solve engineering problems of RC elements
II	Differentiate between working stress design and limit state design
III	Understand the importance of limit state design in reinforced concrete structures.
IV	Design of different structural members like beam, slab, column, footing and stair case

COURSE OUTCOMES (COs):

CO 1	Describe the Concepts of RC design, material Stress–Strain curves, factors, characteristic values, Stress block parameters, Working Stress Method, Limit state analysis, design of singly, doubly reinforced T, and L beam sections.
CO 2	Understand Limit state analysis and design of section for shear and torsion, concept of bond, anchorage and development length, I.S. code provisions.
CO 3	Explore the design concept of two-way Slabs, one-way slabs, continuous slabs using I.S. coefficients, Cantilever slab/ Canopy slab.
CO 4	Design of short and long column, Axial loads, uni-axial and bi-axial bending I.S. Code provisions.
CO 5	Design footings–Isolated (square, rectangle) and Combined Footings. Design of Stair Case.

COURSE LEARNING OUTCOMES (CLOs):

ACE009.01	Describe the basic concepts of RC design.
ACE009.02	Understand the concept material Stress–Strain curves, Safety factors.
ACE009.03	Understand the concept Stress block parameters.
ACE009.04	Use the design concept of Working Stress Method.
ACE009.05	Design of singly reinforced, doubly reinforced sections.
ACE009.06	Design of, T, and L beam sections.
ACE009.07	Understand Limit state analysis and design of section for shear.
ACE009.08	Understand Limit state analysis and design of section for torsion.
ACE009.09	Concept of bond, anchorage.
ACE009.10	Concept of development length.
ACE009.11	Illustrate the deflection limits as per IS: 456–2000
ACE009.12	Understand the design concept of one-way slabs.
ACE009.13	Understand the design concept of two-way Slabs.
ACE009.14	Understand the design concept of continuous slabs.
ACE009.15	Calculate the I.S. coefficients for Cantilever slab.
ACE009.16	Calculate the I.S. coefficients for Canopy slab.
ACE009.17	Discuss the concept of short and long column
ACE009.18	Understand the concept of Axial loading.
ACE009.19	Understand the concept of uni-axial and bi-axial bending.
ACE009.20	Apply I.S. Code provisions.

ACE009.21	Design concept for isolated footing.
ACE009.22	Design concept for Combined footing.
ACE009.23	Understand the Design procedure for Stair Case.
ACE009.24	Types of stair Case.

MAPPING OF SEMESTER END EXAMINATION - COURSE OUTCOMES

SEE Question No		Course Learning Outcomes		Course Outcomes	Blooms Taxonomy Level
1	a	ACE009.01	Describe the basic concepts of RC design.	CO 1	Remember
	b	ACE009.06	Design of singly reinforced, doubly reinforced sections.	CO 1	Understand
2	a	ACE009.05	Design of T and L beam sections.	CO 1	Understand
	b	ACE009.06	Design of T and L beam sections.	CO 1	Understand
3	a	ACE009.07	Understand Limit state analysis and design of section for shear.	CO 2	Remember
	b	ACE009.09	Concept of bond, anchorage.	CO 2	Understand
4	a	ACE009.07	Understand Limit state analysis and design of section for shear.	CO 2	Understand
	b	ACE009.010	Concept of development length.	CO 2	Understand
5	a	ACE009.12	Understand the design concept of one-way slabs.	CO 3	Understand
	b	ACE009.12	Understand the design concept of one-way slabs.	CO 3	Remember
6	a	ACE009.13	Understand the design concept of two-way Slabs.	CO 3	Remember
	b	ACE009.13	Understand the design concept of two-way Slabs.	CO 3	Understand
7	a	ACE009.17	Discuss the concept of short and long column	CO 4	Remember
	b	ACE009.18	Understand the concept of Axial loading.	CO 4	Understand
8	a	ACE009.17	Discuss the concept of short and long column	CO 4	Understand
	b	ACE009.18	Understand the concept of Axial loading.	CO 4	Understand
9	a	ACE009.21	Design concept for isolated footing.	CO 5	Remember
	b	ACE009.22	Design concept for Combined footing.	CO 5	Understand
10	a	ACE009.24	Types of stair Case.	CO 5	Remember
	b	ACE009.23	Understand the Design procedure for Stair Case.	CO 5	Understand

Signature of Course Coordinator **HOD, CE**