

B.TECH, CIVIL ENGG.**(SEM V) ODD SEMESTER THEORY EXAMINATION, 2014-15****DESIGN OF CONCRETE STRUCTURES-1 (ECE-505)****Time: 3 Hours****Total Marks: 100**

Note:-- (1) Attempt all the questions.

(2) All questions carry equal marks.

(3) Use of IS-456 2000 code book is permitted.

(4) Any data if missing may be suitably assumed.

1. Attempt any **two** of the following:- **(10x2=20)**

(a) (i) Explain the working stress design philosophy for design of RCC members in flexure.

(ii) What is transformed area and Explain why the concrete cover to reinforcement is required?

(iii) What is the difference between singly reinforced and doubly reinforced beam section?

Explain the role of compression steel in a doubly reinforced beam section.

(b) A beam section 300 mm wide and 560 mm deep is reinforced with 3 bars of 25 mm dia in tension zone & 3 bars of 16 mm dia in the compression zone. The cover to the center of both the reinforcement is 40mm. Determine the moment of resistance of the section if M20 grade of concrete & HYSD bars of Fe 415 grade are used. Use WSM.

(c) An R.C.C. beam of size 230 mm wide x 500 mm overall depth is reinforced with 3 no. 16 mm diameter bars. Take effective cover as 50 mm. Find the uniformly distributed load on a span of 4.0 m, which the beam can resist in addition to its self weight. The materials are M30 grade concrete and HYSD reinforcement of grade Fe 415. Use WSM.

2. Attempt any **two** of the following:- **(10x2=20)**

(a) Derive the stress block parameters in limit state design method.

(b) A simply supported beam of clear span 5m has to carry a superimposed load of 45 KN/m at service (including self weight). The beam has width of support 230mm at each end. Determine the overall depth of beam required and the reinforcement, if breadth of the beam is 230 mm. Use M25 mix concrete & Fe 415 grade steel. Consider moderate exposure conditions.

(c) Design a reinforced section for a rectangular beam at mid span having a simply supported effective span of 4 m. The uniformly distributed load acting on the beam in addition to self weight of the beam is 40 kN/m. The size of beam is limited to 230 mm × 400 mm overall. Consider mild exposure conditions, grade of concrete as M20 and Fe415 grade steel.

3. Attempt any **two** of the following:- **(10x2=20)**

(a) Describe flexural bond and anchorage bond in reinforced concrete. Also establish a relationship for determining the development length.

(b) A simply supported beam of 6 m span (c/c), is to carry a uniformly distributed load of 30 kN/m (including beam weight). The size of the beam is 230 mm wide and 600 mm over all depth and it is reinforced with 4 bars of 25 mm diameter at an effective cover of 50 mm, out of which two bars are bent up at 45° near the support. The width of the supporting wall is 230 mm. Assume M25 concrete and Fe415 steel. Design the shear reinforcement, considering critical section at a distance d from the face of the support.

- (c) Design a rectangular beam section, 300 mm wide and 550 mm deep (overall), subjected to an ultimate twisting moment of 60 kNm, combined with an ultimate bending moment of 135 kNm and an ultimate shear force of 90 kN. Assume M25 grade concrete, moderate exposure conditions and HYSD reinforcement of grade Fe415.

4. Attempt any **two** of the following:-

(10x2=20)

- (a) Design a R.C. slab for a room having inside dimensions 3 m x 7 m. The thickness of supporting wall is 300 mm. The live load on the slab may be taken as 3 kN/m² and floor finish as 1.0 kN/m². Use M 20 mix and Fe 415 grade steel. Assume moderate exposure conditions.
- (b) Design an R.C.C floor slab for a room having inside dimensions 4 m x 5 m resting on 230 mm thick masonry walls. Assume a live load of 3 kN/m² and a floor finish load of 0.75 kN/m². Use M20 grade concrete, mild exposure conditions and HYSD reinforcement of grade Fe415. Assume that the slab is simply supported on four sides and corners are not prevented from lifting.
- (c) A rectangular simply supported beam of effective span 6 m is 300 mm x 600 mm in cross section and is reinforced with 3 bars of 25 mm on tension side with an effective cover of 50 mm. Determine short term deflection due to a dead load of 15 kN/m (inclusive of self weight) and a live load of 10 kN/m. Use M20 grade concrete, moderate exposure conditions and HYSD reinforcement of grade Fe415.

5. Attempt any **two** of the following:-

(10x2=20)

- (a) Draw P_u - M_u interaction curve and explain salient points along with the respective strain profiles.
- (b) Design the reinforcement in a column of size 400 mm x 600 mm, subject to a factored axial load of 2000 kN. The column has an unsupported length of 3 m and is braced against side sway in both directions. Use M25 concrete and Fe500 steel.
- (c) Calculate the load carrying capacity of a short axially loaded circular column with 400 mm diameter reinforced with 6 nos. of 20 mm dia bars of grade Fe415. The helical reinforcement consist of 8 mm dia bars of Fe415 spaced at 50 mm c/c. Assume clear cover to main steel equal to 40 mm and grade of concrete is M25.