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**Odd Semester Examination, 2019-20**  
**B. Tech: Civil (5<sup>th</sup> Semester)**  
**Design of Reinforced Concrete Element**

Time: 3:00 hrs.

Max. Marks: 100

Total no. of printed pages: 2

- Note : (i) Attempt ALL questions.  
(ii) Assume any missing data suitably.  
(iii) Use of code IS-456 is allowed.

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Q1. Attempt any four of the following

4X5=20

- (a) Explain Reinforcement splicing. Also explain curtailment of R/F? 3
- (b) Explain the importance of anchorage of reinforcing bars in flexure and shear. 3
- (c) What is limit state of design of R.C.C. design?
- (d) Explain why limit state design is considered more rational than Working stress design. 3
- (e) Compare the stress strain curve of concrete and mild steel in LSM and WSM? 3
- (f) Write down the conditions when doubly reinforcement is preferable over singly reinforced?

Q2. Attempt any four of the following.

4X5=20

- a) A rectangular beam 250 mm wide and effective depth 500 mm has 4 bars of 22 mm diameter. Find the position of the neutral axis, the lever arm, the forces of compression and tension and the actual moment of resistance, if concrete is M20 mix and steel is Fe 415 grade.
- b) At a particular cross section of R.C beam 300mm × 600 mm in size, a factored bending moment of 120 KN/m, a factored shear force of 100 KN and a factored torsion moment of 60 KN/m are acting. Design the necessary reinforcements using M25 concrete and Fe415 HYSD bars.
- c) List various types of steel reinforcement?
- d) Explain the various types of shear failures and shear design of R.C.C beams..
- e) At a particular cross section of R.C beam 300mm × 600 mm in size, a factored bending moment of 120 KN/m, a factored shear force of 100 KN and a factored torsion moment of 60 KN/m are acting. Design the necessary reinforcements using M25 concrete and Fe415 HYSD bars.

P.T.O

f) What is the purpose of collapsibility and serviceability requirements?

**Q3. Attempt any two of the following**

**2x10=20**

a) Analyze the T beam for following data:

$$b_f = 1500 \text{ mm,}$$

$$D_f = 100 \text{ mm,}$$

$$D = 600 \text{ mm}$$

$$b_w = 300 \text{ mm,}$$

$$f_{ck} = 25 \text{ N/mm}^2,$$

$$f_y = 415 \text{ N/mm}^2,$$

$A_{st} = 8$  bars of 20 mm dia with effective cover 60 mm.

b) A doubly reinforced beam is used for simply supported effective span of 8 m and is subjected to aliye load of 40 KN/m including self weight. clear cover 40 mm. Calculate stress developed in beam? Material used is M 20 and HYSD bar. Use WSM

c) Explain the three design philosophies of reinforced concrete structural elements.

**Q4. Attempt any two of the following**

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**2X10=20**

a) A rectangular beam  $b=350$ mm and  $d=550$ mm has a factored shear of 400 KN at the critical section near the support. The steel at tension side of section consist of 4-32 mm bars continued to support. Use M25 grade and Fe 415 grade steel. Design vertical stirrups for section.

b) A circular column with helical reinforcement of 400 mm diameter and 4m in length to carry factored load of 1000 KN. The column is hinged at both ends. Use M25 grade and Fe 415 grade steel.

c) Design a plane concrete footing for a column 350 mm x 350 mm carrying an axial load 400 KN (excluding self weight) Assuming an allowable bearing pressure of 300 KN/m<sup>2</sup> at adepth of 1.5 m below ground. Assume M20 and Fe 415 steel.

**Q5. Attempt any two of the following.**

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**2X10=20**

a) Design a simply supported roof slab for a room 7.5x3.5m clear in size. slab is carrying an imposed load of 5KN/m<sup>2</sup>. Use M20 grade and Fe 415 grade steel.

b) Write down the steps for designing of two way slab?

c) Design a reinforced concrete slab of size 6m X 4m whose one short edge is discontinuous and corners are restrained at supports. The slab has to carry a live load of 3 KN/m<sup>2</sup> and a floor finish of 1 KN/m<sup>2</sup>. Use M20 concrete and Fe415. Sketch the details of reinforcements.