

**B.Tech. SEM -VI (Civil) 2014 Course (CBCS) : SUMMER - 2019**  
**SUBJECT: STRUCTURAL DESIGN-II\***

Day: Wednesday  
 Date: 22/05/2019

Time: 02.30 PM TO 06.30 PM  
 Max. Marks: 60

S-2019-2714

**N.B:**

- 1) All questions are **COMPULSORY**.
- 2) Use of I.S. 456- 2000 and interaction charts and electronic non programmable **CALCULATOR** is allowed.
- 3) Draw neat labeled diagrams **WHEREVER** necessary.
- 4) Figures to the right indicate **FULL** marks.
- 5) Assume suitable data, if necessary.

**Q.1 a)** Compare working stress method and limit state method. (05)

**b)** 'Even though concrete of grade M25 is used, the design stress in flexure is taken as  $11.15 \text{ N/mm}^2$ '. Explain with a diagram. (05)

OR

**Q.1 a)** Draw a typical stress strain curve for mild steel and explain the salient points. (05)

**b)** Define 'characteristic strength and characteristic load'. How it is useful in determining partial safety factor? (05)

**Q.2 a)** What is a DRB? Under which situations it is used? (04)

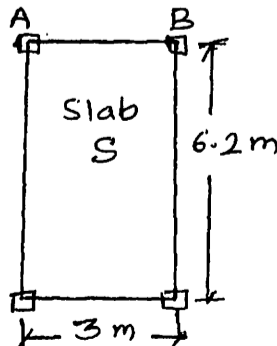
**b)** A R.C. beam  $230\text{mm} \times 575\text{mm}$  is subjected to a uniformly distributed load of  $70 \text{ kN/m}$  inclusive of self weight over a simply supported span of  $5\text{m}$ . Design the beam for flexure. Grade M20,  $F_e 415$  is used. Given: for Fe 415.

$d/d$	0.05	0.10	0.15	0.20
$f_{sc}$ in $\text{N/mm}^2$	355	352	342	329

OR

**Q.2 a)** Derive the equation of moment of Resistance of a singly reinforced rectangular beam with the help of a stress block. (04)

**b)** Slab 'S' is  $115 \text{ mm}$  thick and carries a u.d.l. of  $7.5 \text{ kN/m}$ . Beam AB carries a parapet wall of  $1\text{m}$  height and  $100\text{mm}$  thickness. Design beam AB using M25,  $F_e 500$  for flexure only. (06)



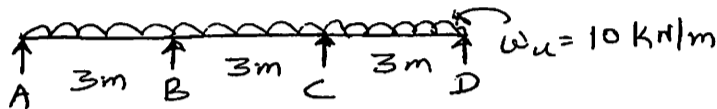
P.T.O.

- Q.3 a) Define bond. What are the various types of bond? Mention the location at which the check for development length is given. (04)
- b) A rectangular beam simply supported over a span of 4m is 230mm × 375 mm in cross section. It is reinforced with 3 bars of 20mm diameter. The beam is loaded with total u.d.l. of 10kN/m. Design vertical stirrups for the beam. Use M20,  $F_c$  415. (06)

OR

- Q.3 a) A simply supported beam of span 5m is subjected to a total factored u.d.l. of 50 kN/m. Cross section of the beam is 230mm × 575 mm. Determine the area of tension reinforcement and design the shear reinforcement for the beam. Use M20,  $F_c$  415. (06)

- b) (04)



For the continuous beam shown, determine the design moments at midspans and at supports. (04)

- Q.4 a) What is L/d ratio in design of slab? What are the modification factors? (04)
- b) Design a one way simply supported floor slab of an office building of effective span 3m. Use M25,  $F_c$  500. (06)

OR

- Q.4 a) 'The check for shear in case of slabs is always satisfied' \_\_\_\_\_ Justify. (04)
- b) Design a one-way cantilever slab of a balcony at floor level of a residential building of effective span 2.2m. Use M25,  $F_c$  500. (06)

OR

- Q.5 a) What are the functions of longitudinal reinforcement in a column? What is its minimum diameter? (04)
- b) Design a short R.C. column of size 230mm × 575mm for an effective height of 3.6m carrying a working load of 750kN and working moment about major axis of 30kNm. Use M20,  $F_c$  415. (06)

OR

- Q.5 a) What are the functions of a transverse reinforcement? A 400mm square column is reinforced with 8 bars of 20mm diameter. Design the transverse reinforcement. (04)
- b) Design a R.C. column of size 230mm × 600mm carrying an axial load of 1000 kN and moment about minor axis 40 kNm. Effective length is 3.6m. Use M20,  $F_c$  415. (06)

- Q.6 Design the footing for a column of size 230mm × 600 mm carrying an axial load of 1150 kN. Use M20,  $F_c$  415. (10)

OR

- Q.6 a) Draw and explain the stress distribution diagrams below the footing for different types of soils. (04)
- b) Decide the dimensions of a footing for a column of size 230 mm × 575 mm carrying an axial load of 1200 kN. Safe bearing capacity of soil is 200 kN/m<sup>2</sup>. Use M25,  $F_c$  500. (06)

\* \* \* \* \*