

- (ii) Beams on either side are 400×500 mm with 3 nos of 28 mm dia on the top and 3 nos of 25 mm dia at bottom. Assuming $f_{ck} = 25 \text{ kN/mm}^2$ and $f_y = 415 \text{ N/mm}^2$. Design the joint. 10,10

7. A simply supported reinforced concrete 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 nos. 20 mm dia Fe 415 at an effective depth of 400 mm. Two hanger bars of 10mm dia are provided. The self-weight together with dead load on the beam is 4 kN/m and service live load is 10 kN/m. Using M20 grade concrete and Fe 415 grade steel compute : (a) Short-term deflection, (b) Long-term deflection, (c) Maximum crack width at tension face directly under bar. 20
8. R.C. gird floor is to be designed to cover a floor area of $20 \text{ m} \times 16 \text{ m}$. The spacing of ribs in mutually perpendicular directions is 1.5 mc/c. Live load on the floor is 3 kN/m^2 . Analyse the grid floor by IS-456 methods and design the suitable reinforcements with grid floor. 20

Roll No. :

Total No. of Questions : 8] [Total No. of Pages : 4

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**M.Tech. 1st Semester (Civil Engg.)
(Elective-I)
Examination, March-2021**

ADVANCED REINFORCED CONCRETE DESIGN
Paper-CE-614

Time : Three Hours]

[Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

- Note :-** (i) Attempt any five questions. All questions carry equal marks.
(ii) Use of IS : 456 is allowed.
(iii) Assume suitable data wherever necessary.
1. (a) Distinguish between Short-term and Long-term deflections in RC members.
(b) What is the magnitude of crack width allowed in the concrete structure ? 10,10

2. A simply supported one-way slab 180 mm having an effective span of 4.2 m is reinforced with 10 mm diameter bars spaced at 125 mm c/c at an effective cover of 25 mm. The slab is subjected to a live load of 4kN/m^2 and a surface finish of 1.6kN/m^2 . Use M25 concrete and Fe 500 grade steel. Assume ultimate shrinkage strain = 0.0003 and creep coefficient = 1.6. Estimate the only the long-term deflection.

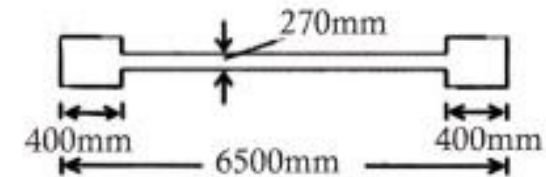
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3. A reinforced concrete deep girder is continuous over spans of 8 m apart, from center to center. It is 4.5 m deep, 300 mm thick and the supports are columns 800 mm in width. If the girder supports a udl of 250 kN/m including its self-weight, design the necessary reinforcement. Use M25 concrete and Fe 415 grade steel.

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4. Design a shear wall of length 8 m and thickness 270 mm subjected to the following forces. Assume moderate exposure condition. Assume $f_{ck} = 30\text{ Mpa}$ and $f_y = 415\text{ Nmm}^2$ and the wall is a high wall with the following loadings : Sketch the reinforcement details.

Loading	Axial Force (kN)	Moment (kNm)	Shear (kN)
Dead Load + Live Load	2050	650	40
Seismic Load	300	5200	650



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5. A slab of total depth 200 mm is designed for two way action over $6\text{ m} \times 7\text{ m}$. The reinforcement in short span consists of 12 mm at 220 mm spacing and that in the long span is 12 mm at 300 mm spacing. Check whether these satisfy IS456 empirical rules for crack control.

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6. The following are the details of an internal beam column of type 1 joint subjected to reversals which are not due to earthquake :

- (i) Column $500 \times 450\text{ mm}$ with 8 nos-25 mm dia bars. Column factored load = 1500 kN. Storey height = 3 m.