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GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Third Semester - Regular) Examinations, December – 2022

21BAEES23003– Design of Structures

(AGE)

Time: 3 hrs

Maximum: 70 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

(IS 456:2000 & IS 800:2007 Code Books are allowed)

PART – A

(2 x 5 = 10 Marks)

Q.1. Answer **ALL** questions

	CO #	Blooms Level
a. Write any three grades of concrete with the mix ratios.	1	2
b. What will be the compression moment of resistance of T-beam in case of neutral axis lies in the flange part?	2	2
c. Write the conditions to find the pitch value for transverse reinforcement of a column.	3	2
d. What will be the minimum steel reinforcement required in slab in case of mild steel and HYSD steel?	2	2
e. Calculate the shearing strength of a 20 mm diameter grade 4.6 bolt. The threads of bolts may be assumed not to fall in the shear planes.	4	2

PART – B

(15 x 4 = 60 Marks)

Answer ALL questions

	Marks	CO #	Blooms Level
2. a. Design an RCC column having size 450 mm x 600 mm. Both the unsupported length and effective length of column are 3m. The column is subjected to load 2200 kN. (Use M25 concrete and Fe415 steel)	8	3	3
b. Find the area of longitudinal steel of a square RCC column of 500 mm x 500 mm. Unsupported length and effective length are 4 m and 2.6 m respectively. The column is subjected to an axial load of 2000 kN. (Use M25 concrete and Fe415 steel)	7	3	3

(OR)

c. Design a RCC beam of span length 4m, can able to resist a factored bending moment of 100kNm.			
a. M20 grade concrete, Fe415 grade steel	15	1	3
b. M25 grade concrete, Fe 500 grade steel			
3.a. Find the area of steel of an RC slab for a room having inside dimensions 3m x 6.5m. The thickness of supporting wall is 300 mm. The live load on the slab may be taken as 3 kN/m ² and floor finish 1.5 kN/m ² . Assume slab is simply supported at the ends. (Use M20 concrete and Fe 415 steel)	8	1	3
b. An RCC beam section of 250 mm x 400 mm is reinforced with 4-20mm bars with an effective cover of 30 mm. Check whether under reinforced or over reinforced section. (Use M20 concrete and Fe 500 steel)	7	1	3

(OR)

c. Find the area of steel of an RC slab for a room having inside dimensions 4m x 5m. The thickness of supporting wall is 300 mm. The live load on the slab may be taken as 3 kN/m ² and floor finish 1.5 kN/m ² . Assume slab is simply supported at the ends. (Use M25 concrete and Fe 500 steel)			
	8	1	2

- d. Find the depth of the neutral axis, compressive force, tensile force, lever arm and ultimate moment capacity, if the beam size (b x d) 250 mm x 400 mm and reinforced with 2-16mm and 2-20 mm steel bars in tension. 7 1 2
(Use M25 grade concrete, Fe500 grade steel)
- 4.a. Calculate the moment of resistance of R.C. beam of rectangular section 250 mm wide and 500 mm deep, if it is reinforced with 6 number of 20 mm bars on tension side and 2 number of 20 mm bars on compression side. Effective cover provided is 40 mm on both sides. ($f_{sc} = 0.87f_y$) 8 2 3
(Use M20 concrete and Fe250 steel)
- b. Determine the ultimate moment capacity of a doubly reinforced beam with $b=300$ mm, $D=600$ mm, reinforced with 6 bars of 16 mm on compression side and 6 bars of 20 mm on tension side. Effective cover provided is 50 mm on both sides. ($f_{sc} = 323$ MPa) 7 2 3
(Use M25 concrete and Fe415 steel)
- (OR)
- c. A T-beam R.C. floor system consists of 125 mm thick slab supported by beams at 3m centre to centre. The effective width and depth of web is 300 x 550 mm. Main reinforcement consists of 8 bars of 20 mm diameter. Determine the moment of resistance of T-beam, if it is used as simply supported beam of span 3.6m. (Use M20 concrete and Fe 415 steel) 8 2 3
- d. A T-beam of 3m wide and 125 mm thick slab supported by beams at 3m centre to centre. The effective width and depth of web is 230 x 470 mm. Main reinforcement consists of 8 bars of 20 mm diameter. The span length is 3.6m. Find out the effective width and depth of neutral axis for the following cases, if the neutral axis lies in the flange. 7 2 3
(i) Continuous T beam
(ii) Isolated T beam
(Use M25 concrete and Fe 415 steel)
- 5.a. Calculate the strength of a 20 mm diameter bolt of grade 4.6 for the following cases. The main plates to be jointed are 10 mm thick. 15 4 3
(i) Lap joint
(ii) Single cover butt joint; the cover plate being 8 mm thick
(iii) Double cover butt joint; each of the cover plate being 8 mm thick.
- (OR)
- b. Two flats (Fe 410 Grade Steel), each 210 mm x 10 mm, are to be jointed using 16 mm diameter, 4.6 grade bolts. The joint is supposed to transfer a factored load of 200 kN. Determine the no. of bolts. 15 4 3
(i) Lap joint
(ii) Double cover butt joint; each of the cover plate being 6 mm thick.

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