BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2023)

CLASS: BTECH/BARCH   SEMESTER : V
BRANCH: CIVIL/ARCHITECTURE   SESSION : MO/2023

SUBJECT: CE301-STRUCTURAL DESIGN - I

TIME: 02 Hours   FULL MARKS: 25

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates
5. IS 456 is allowed in the examination hall.

			CO	BL
Q.1(a)	What are the drawbacks of concrete?	[2]	3	K1
Q.1(b)	List five different cements that are in use today.	[3]	3	K1
Q.2(a)	Enumerate the major limit states commonly used in limit state design.	[2]	3	K2
Q.2(b)	Draw the idealised stress-strain curve of concrete.	[3]	3	K2
Q.3(a)	Calculate the ultimate moment carrying capacity of a rectangular beam having width of 300 mm, effective depth of 545 mm, Ast = 1473 mm^2. Assume grade of concrete as M20 and grade of steel as Fe415.	[2]	1	K3
Q.3(b)	Determine the reinforcements required for a rectangular beam having width of 300 mm, overall depth of 600 mm. Factored bending moment is 320 kN-m. Assume grade of concrete as M20, grade of steel as Fe415 and clear cover as 25 mm.	[3]	2	K3
Q.4(a)	A cantilever beam carrying a uniformly distributed load is reinforced with 4 nos. 16 mm diameter tensile steel of grade Fe415. Calculate the anchorage length (development length) assuming grade of concrete as M30.	[2]	1	K2
Q.4(b)	Determine the ultimate moment of resistance of an isolated T-beam having width and depth of flange of 850 mm and 100 mm respectively. Width of web is 250 mm and effective depth is 530 mm. Area of tensile steel at bottom is 1884 mm^2. Assume grade of concrete as M20 and grade of steel as Fe415.	[3]	2	K3
Q.5(a)	A reinforced concrete beam of size 300 mm wide x 600 mm depth is subjected to a bending moment of 150 kN-m, shear force of 120 kN and torsion of 60 kN-m. Calculate the equivalent bending moment and equivalent shear force.	[2]	3	K2
Q.5(b)	A reinforced concrete beam of 6 m span requires 7 nos. Fe415 bars of 20 mm diameter as tension bars. Find the distance from the centre of the beam where the central bar can be curtailed. Assume grade of concrete as M20 and effective depth of beam as 500 mm.	[3]	2	K3

TABLE-1

(To be used wherever required)

STRESS IN COMPRESSION REINFORCEMENT FOR d'/d RATIOS

Grade of steel	Fe 415			
d'/d	0.2	0.15	0.1	0.05
f_{sc} (N/mm^2)	329	342	353	355

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