MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH. END SEMESTER EXAMINATIONS

MAKE-UP EXAM

SUBJECT: BASIC REINFORCED CONCRETE DESIGN [CIE 2223]

Date of Exam: Time of Exam: Max. Marks: **50**

Instructions to Candidates:

- Answer all questions.
- Any missing data may be suitably assumed.
- Use of IS 456:2000 and SP-16 handbooks are permitted.

Q. No.	Questions	Marks	CO	BL
1A.	With neat figures explain the balanced, under-reinforced and over-reinforced RCC section.	**5**	**1**	**2**
1B.	A cantilever beam with an effective span of 2.75 m carries a working load of 15 kN/m. The grade of concrete is M35 and grade of steel is Fe415. The beam is exposed to moderate exposure condition. Assume breadth of the beam as 300 mm. Also assume span to depth ratio as 5 for the initial calculation of effective depth. Assuming #20 bars, determine the area of steel and number of bars required.	**5**	**2**	**3**
2A.	A simply supported flanged beam of size 300 mm wide 475 mm effective depth is reinforced with 5, # 16 on the tension side and 3, #12 on compression side. The largest effective span of the beam is 4.23 m. If the flange width of the beam is 3000 mm, determine whether the deflection check satisfies or not. Assume M25 and Fe415, grade concrete and steel respectively.	**5**	**2**	**3**
2B.	An RCC continuous beam of size 230 mm × 600 mm is subjected to a factored dead load and live loads of 15 kN/m and 10 kN/m respectively. Determine the main reinforcements required (sagging and hogging) for an interior span of 6 m (effective) using #16 bars. Assume a moderate exposure condition. Consider M20 concrete and Fe415 steel.	**5**	**2**	**3**
3A.	A simply supported one-way slab of clear span 2.5 m is supported on masonry walls of thickness 230 mm. Assume a floor finish load of 0.8 kN/m^2 and a live load of 3 kN/m^2 at service conditions. Assuming #12 bars calculate the area of main reinforcement. For effective depth approximation, consider a span to depth ratio of 28. Consider moderate exposure conditions. Check for deflection and shear not needed. Consider M25 concrete and Fe415 steel.	**5**	**3**	**3**
3B.	A two-way panel of size 4 m × 6 m is simply supported on beams of 300 mm thickness. The slab does not have adequate provision to resist torsion at corners to prevent corners from lifting. If the effective depth of the slab is 120 mm, calculate the area of main reinforcement along short span only. The total factored load on the slab is 11.625 kN/m^2(inclusive of DL and LL). Assume M20 grade concrete and Fe415 grade steel. Effective cover to the main reinforcement is 30mm.	**5**	**3**	**3**

4A.	A column of size 230 mm × 450 mm is subjected to an axial working load of 1000 kN. The unsupported length of the column is 3.3 m and it is effectively held in position and restrained against rotation at both the ends. Assuming #16 bars determine the main reinforcement. Consider M35 concrete and Fe415 steel.	**5**	**4**	**3**
4B.	A short rectangular column of size 300 mm × 400 mm is reinforced with 8, #25 bars. The column is subjected to an ultimate load of 1500 kN and an ultimate moment of 100 kN.m with respect to its major axis and 70 kN.m. Check capacity of the column using SP 16 handbook. Consider M25 concrete and Fe415 steel. Assume an effective cover of 60 mm.	**5**	**4**	**3**
5A.	Following are the details of an isolated rectangular footing, • Soil pressure below the foundation at service loads = 130 kN/m^2 • Thickness of footing = 600 mm • Size of column = 230 mm × 450 mm • Length and width of footing = 2.6 m × 5 m • Effective cover to main reinforcement = 55 mm Determine the reinforcement required for the footing using #20 bars. Assume M30 grade concrete and Fe415 steel.	**5**	**5**	**3**
5B.	Following are the details of an isolated footing, • Length and width of footing = 3.5 m × 3.5 m • Size of column = 0.60 m × 0.60 m • Service axial load on column = 2000 kN • SBC of soil = 200 kN/m^2 • Steel in footing = 0.25% Determine the depth/thickness of footing from i) moment condition ii) single shear condition. Assume M30 grade concrete and Fe415 steel.	**5**	**5**	**3**