**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**
**(END SEMESTER EXAMINATION)**

**CLASS: BTECH** **SEMESTER : VI**
**BRANCH: CIVIL** **SESSION : SP/2025**

**SUBJECT: CE435 ADVANCED CONCRETE STRUCTURES DESIGN**

**TIME: 3 Hours** **FULL MARKS: 50**

**INSTRUCTIONS:**
**1. The question paper contains 5 questions each of 10 marks and total 50 marks.**
**2. Attempt all questions.**
**3. The missing data, if any, may be assumed suitably.**
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
**5.Use of IS code IS 456 2000 is allowed to the candidates in the examination hall.**

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| Q.1(a) | What are drop panels and column heads used in flat slabs? How do they influence shear capacity and moment distribution? | [5] | | Analyze |
| Q.1(b) | What are the critical shear considerations in flat slab design? How is punching shear checked, and what provisions are made in IS 456:2000 to resist it? | [5] | | Apply |
| Q.2 | Design the geometry and wall of a reinforced concrete cantilever retaining wall to retain 4.5 m high earth with a horizontal surface at the top. The retained soil is well drained medium dense sand of unit weight 16.5 $kN/m^3$ and internal angle of resistance 30°. The material under the wall base is the same as above with a safe bearing capacity of 160 $kN/m^2$. The coefficient of friction between the base and the soil is 0.55. The grade of concrete is M20 and Fe415 respectively | [10] | | Apply |
| Q.3 | Design a corbel to support a factored load of 400 kN at a distance of 200 mm from the face of a 300 mm × 400 mm column. Adopt M-25grade concrete and Fe-415grade HYSD bars. Provide the necessary reinforcement details for the corbel. | [10] | | Apply |
| Q.4(a) | Describe the purpose and location of expansion joints in water tanks. | [5] | | Understand |
| Q.4(b) | Design the section of water tank to resist a bending moment of 30 kNm/m. Assume length of structure more than 15 m. The materials are M30 grade concrete and HYSD reinforcement of grade Fe415. Permissible stress of concrete in bending is 10 $N/mm^2$ and permissible stress of steel in tension is 130 $N/mm^2$. | [5] | | Apply |
| Q.5 | Design the Plan dimension and thickness of the combined footing based on shear criteria for two columns $C_1$ (400 mm × 400 mm with 4–25 Ø bars) and $C_2$ (500 mm × 500 mm with 4–28 Ø bars) supporting axial loads $P_1$ = 900 kN and $P_2$ = 1600 kN respectively (under service dead and live loads). The column $C_1$ is an exterior column whose exterior face is flush with the property line. The centre-to-centre distance between $C_1$ and $C_2$ is 4.5 m. The allowable soil pressure at the base of the footing, 1.5 m below ground level, is 240 $kN/m^2$. Assume steel of grade Fe 415 in columns as well as footing, and concrete of M 30 grade in columns and M 20 grade in footing. | [5] | | Apply |

**::::::28/04/2025::::::M**