COURSE CODE (CREDITS):18B1WCE831 (3)　　　　　　　　MAX. MARKS: 35
COURSE NAME: Advanced Reinforced Concrete Design
COURSE INSTRUCTORS: Dr. KAUSHAL KUMAR　　　　　MAX. TIME: 2 Hours

Note: (a) All questions are compulsory.
　　　　(b) IS456:2000 is allowed.

Q.No	Question	CO	Marks
Q1	A simply supported rectangular reinforced concrete beam has a clear span of 5 m and carries a uniformly distributed live load of 12 kN/m in addition to its self-weight. The beam has a width of 250 mm and an effective depth of 500 mm. Use M20 grade concrete and Fe415 steel. Using the **Working Stress Method**, determine: 1. The moment of resistance of the beam section. 2. Whether the given beam section is safe under the applied loads. Assume the following: • Modular ratio, m=13.33 • Permissible stress in steel, $\sigma_{st} = 230$ N/mm² • Permissible stress in concrete in bending compression =7 N/mm²	1	7
Q2	Determine the permissible service load for a rectangular slab of size 4 m × 6 m and depth as 150 mm which is simply supported on all sides and is reinforced with 10 mm bars @ 150 mm c/c in shorter direction and 10 mm bars @ 200 mm c/c in longer direction. Take effective cover as 25 mm and use M20 concrete and Fe 415 steel.	2	7
Q3	Design a rectangular underground water tank of dimension **10m x 4m x 4m** with following data: • Density of Soil = 16kN/m³ • Angle of repose = 30° • Live load on top slab = 3 kN/m² Use M25 concrete and Fe 415 steel. There is no chance of water rise. *i. Design for the case where tank is empty and active earth Pressure is acting.*	3	7
Q4	Check the stability of a cantilever retaining wall to retain horizontal earthen embankment of height 4 m above the ground level. The earthen backfill is having a density of 18 kN/m³ and angle of internal friction as 30°. The safe bearing capacity of the soil is 180 kN/m². The coefficient of friction between soil and concrete is assumed to be 0.45. Use M20 concrete and Fe 415 steel.	4	7
Q5	Design a combined footing for two columns, C_1 and C_2, 400 mm × 400 mm and 500 mm × 500 mm in size and carrying 500 kN and 800 kN of load respectively. The smaller column is 0.4 m away from the property line. The columns are 4 m apart. The bearing capacity of the soil is 140 kN/m². Use M20 concrete and Fe 415 steel.	5	7