B E Civil Engineering Fourth Year First Semester SUPPLEMENTARY Examination – 2024

Subject: Design of structures –III

Time : Three hours **Full Marks: 100**

Use separate answer script for each part
Part – I (full marks = 60)
Assume reasonable values of any data if required. The notations have their usual meaning.
IS-875 part-III, IS 456 and SP-16 are allowed in the examination hall.

CO1 [20]	Q.1 A G+8-storey RCC hospital building (24m x 24m in plan) is to be constructed at Kolkata. Columns are placed 6m c/c along both directions. Floor to floor height is 3.3 m except ground floor which is 2.9m for parking. The service block is separated structurally from the main building by an expansion joint. Determine the design wind pressure and forces in the internal frame. Calculate also the bending moment and shear force on an internal frame (with diagram) at the 7^{th} floor level only. The plinth level is 150 mm above ground level and the top of the pile cap is 500mm below Ground level. Assume any data is not given.
CO2 [5]	Q2 What is the difference between OMRF and SMRF? Explain with sketches
CO3 [15]	Q3 A pre-stressed concrete beam of cross-section 300 mm x 600 mm deep is simply supported over a span of 10 m. The beam is pre-tensioned by 4 tendons. Each tendon consists of 4nos 5mm dia wires. The tendons are located at 100 mm from bottom. The Initial pre-stress in the tendons is 1500 MPa. Assume 14% loss of pre-stress. The live load on the beam is 30 KN/m. Determine the stresses at the center and support for both initial and service condition. **Or** What are the differences between pre-tension and post-tension system in Pre-stressed Concrete structures ? What are the different types of losses in pre-stressing?
CO4 [20]	Q4 Design and detail a pile cap having four piles of diameter 500mm and length 25m.The axial load and the two moments for the critical load case are 440 KN ,20KNm, and 200 KNm respectively. The vertical load capacity of the pile is 700 KN. Use M25 and Fe500

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DESIGN OF STRUCTURES – III

Part - II

Marks – 40

(Answer any two questions)

(IS 800 and SP 6 (1) are allowed in the hall)

1. Suggest a 18 m span gantry girder section supporting a crane of 18 m span .The electrically operated crane has a weight of 500 kN and has two wheels on each gantry girder with a wheel base distance of 4 m on which a 250 kN crab moves carrying a lifting load of 500 kN. Check the section for bending only. 20

2. Design and detail a stepped column fixed at base and hinged at top .The crane and roof legs are 8 m and 2 m respectively .The column carries 60 kN and 600 kN vertical loads at roof and crane levels respectively and a udl due to wind load of 3 kN/m throughout the column height. 20

3. Consider the data of problem 2. Assuming 2 - ISMB 600 @800 mm c/c as the crane leg,design and detail the base connection. 20