

B.E Civil Engineering Examination, 2025

4th year, 1st semester

Design of structures –III

Time 3 hours

Use separate answer scripts for each Part

Full Marks 100

Part –I (Full marks = 60)

Assume reasonable values of any data if required

IS 875 part III , IS 456 and SP -16 are allowed

Notations have their usual meaning .

- Q 1(CO 1) A G+10 storey RCC hospital building (20m x 20m in plan) is to be constructed at Kolkata. Columns are placed 5m c/c along both direction. Floor to floor height is 3.2 m except ground floor which is 3.0 m for parking. The service block is separated structurally from the main building by expansion joint. Determine the design wind pressure and forces in the frame. Calculate also the bending moment and shear force on an internal frame (with diagram) at 6th floor level only. Take the plinth level is 100 mm above ground level and top of the pile cap is 800mm below Ground level. Assume any data not given. 20
- Q2 (CO2) a) What are the different framing systems generally used for tall buildings? Show with neat sketches.
(b) List the load combinations (Limit state Method) for a typical rectangular shaped building under DL, LL and EL (assume WL is not significant). 5+5
- Q 3 (CO3) A simply supported pre-stressed concrete beam of cross section 300 mm x 750 mm deep is loaded with a uniformly distributed live load of 100KN/m on a span of 8 m. Obtain the distribution of stresses at quarter span and at mid span for the initial and final conditions. The beam is post-tensioned by 4 tendons of 250 mm² each. The tendons are located at 100 mm from bottom. The Initial pre-stress in the tendons is 1700 MPa. Assume 16% loss of pre-stress. 10
- Q4 (CO4) Design and detail a pile cap having four piles of diameter 600mm and length 25m. The axial load and the two moments for the critical load case(unfactored) are 1700 KN , 40 KNm and 280 KN m respectively. The vertical load capacity of the pile is 600 KN. Use M25 and Fe500 20

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B.E. Civil Engineering, Fourth Year First Semester Examination, 2025

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 20 m span gantry girder section supporting a crane of 18 m span .The electrically operated crane has a weight of 400 kN and has two wheels on each gantry girder with a wheel base distance of 4 m on which a 200 kN crab moves carrying a lifting load of 400 kN. Suggest a section and check for shear 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 3 m respectively .The column carries 50 kN and 650 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 550 @800 mm c/c as the crane leg,design and detail the base connection. 20