CBCS SCHEME

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18CV72

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
Design of RCC and Steel Structures

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any ONE full question each from Module-1 and Module-2.***
2. Use of IS – 456, SP – 16, IS – 800, SP(6) and steel tables is permitted.
3. Missing data, if any, may be suitably assumed and same must be stated clearly.

Module - 1

1 Design slab type or slab beam type combined footing for two columns A and B spaced at 3.5m center to center. Cross section dimensions of column A is 400 × 400mm and carries an axial load of 1050kN. Cross section dimensions of column B is 500 × 500mm and carries an axial load of 1250kN. Safe bearing capacity of the foundation soil is 240 kN/m^2. The width of the combined footing is restricted to 2.00m. Use M-25 grade concrete and Fe-415 grade steel. Draw neat sketch of reinforcement details. **(50 Marks)**

OR

2 Design A cantilever retaining wall to retain soil embankment for a height of 3.5m above the average ground level. The back fill is horizontal at the top. The unit weight of soil is 16kN/m^2 and safe bearing capacity of the formation soil is 150 kN/m^2. The angle of repose of the soil is 30° and the coefficient of friction between concrete surface and soil may be taken as 0.55. Use M – 20 grade concrete and Fe – 415 steel. Draw a neat sketch of the designed reinforcement details. **(50 Marks)**

Module – 2

3 Design a welded gantry girder to be used in an industrial building for carrying a manually operated over head crane for the data as listed below :
Crane capacity = 200kN
Self weight of crab consisting trolley, motor, hooks, etc. = 40kN
Self weight of crane girder excluding crab (trolley) = 200kN
Minimum hook approach = 1.20m
Wheel base of crab (trolley) = 3.50m
Centre to centre distance between gantry rails = 16m(span of crane girder)
Centre to centre distance between columns = 8.00 (span for gantry girder)
Self weight of rail section = 300N/m
Diameter of crane wheel = 150mm
The steel used is Fe – 410 grade. Draw a neat sketch of the designed details. **(50 Marks)**

4. Design a bolted steel Howe truss having an effective span of 12.00m. The geometry of the truss is as shown in Fig.Q4. The forces induced in the members due to dead load, live load and wind load is tabulated in Table.Q4. Determine the design forces in the members due to various combination of loads as per IS – 800 provisions and hence design principal rafter, principal tie and main sling member with all the necessary safety checks including the reversal of stresses. Also design support joint 'A' by considering the size of supporting reinforced cement concrete column as 300 × 300mm, the design bearing pressure on the concrete is limited to 2N/mm^2 and the design bond stress between anchor bolt and concrete is limited to 1.2N/mm^2. Use M16 ordinary black bolts of grade 4.6 for designing member and connection with gusset plate and M25 bolt as anchor bolt at supports. List the design details.

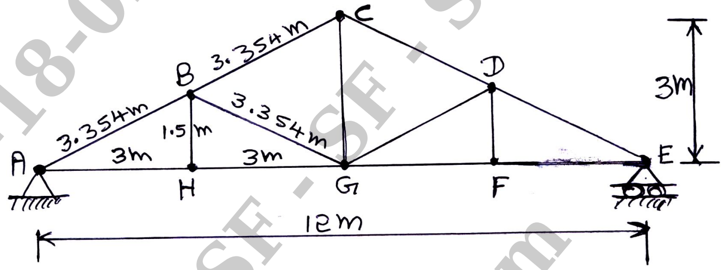

Fig.Q4

Members	Dead load kN	Live load kN	Wind load kN
Rafter AB, BC, CD and DE	–58.00	–52.52	+95.60
Tie member AH, HG, GF and FE	+52.00	+47.00	–76.00
Main sling BG, DG	+20.30	+18.40	–63.00

Table Q.4

Note :
i) (–) indicates compressive force
ii) (+) indicates tensile force
iii) Net support reaction ↑ = 45kN (at 'A')
iv) Net up-lift support reaction ↓ = 55kN (At 'A'). **(50 Marks)**

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