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320651(20)

APR-MAY 2022

B. E. (Sixth Semester) Examination, ~~2020~~

(New Scheme)

(Civil Engg. Branch)

STRUCTURAL ENGINEERING DESIGN : II

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Part (a) of each question is compulsory. Solve any one part from (b) and (c). Use of IS800:2007 and steel table is permitted.*

Unit-I

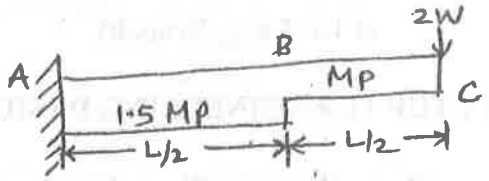
1. (a) Draw the neat sketch of a Idealised stress-strain curve of mild steel and identify the three regions. 2

(b) (i) Prove that the yielding zone or hinge length of plasticity zone is equal to 1/3rd of the span. 14

(ii) Explain the methods of plastic analysis.

(c) (i) Calculate shape factor for a square of side a with its diagonal parallel to the *zz* axis. 14

(ii) Find out the collapse load for the cantilever as shown in figure.



Unit-II

2. (a) What does 4 and 6 imply for the bolts of grade 4.6. 2

(b) Two plates 180 mm × 10 mm each are connected by a double cover single bolted but/joint with 16 mm diameter of bolt grade 4.6. The cover plates are 6 mm thick. Determine the strength of the joint. 14

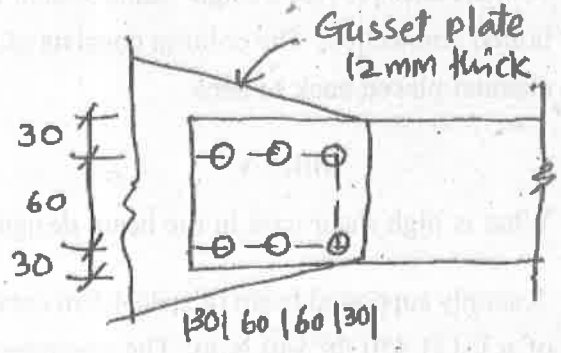
(c) A tie member of a roof truss consists of 2 ISA 100 mm × 75 mm × 8 mm. The angles are connected to either side of a 10 mm gusset plates

and member is subjected to a tensile force of 300 kN. Design the welded connection. Assume connections are made in workshop. 14

Unit-III

3. (a) Explain shear log. 2

(b) Determine the design tensile strength of the plate 120 mm × 8 mm connected to a 12 mm thick Gusset plate with bolt holes. The yield strength and ultimate strength of the steel used are 250 MPa and 410 MPa. The diameter of the bolt used is 16 mm. 14



(c) A single angle member carries a factored axial load of 400 kN. Design the member and the connection with the gusset plate 10 mm thick use Fe 410 grade steel. 14

Unit - IV

4. (a) Why ISHB is preferred for a column section. 2

(b) An ISHB 400 @ 806·4 N/m is to be used as a column 3·5 m long with both ends restrained against rotation and translation. Determine the design axial compressive strength of the column section. Take $fy = 250\ \text{N/mm}^2$, $fu = 410\ \text{N/mm}^2$ and $E = 2\times10^5\ \text{N/mm}^2$. 14

(c) Design a laced column 9 m long to carry a factored axial load of 1200 kN. The column is fixed at both the ends provide a single lacing system with bolted connection. The column consists of two channel placed back to back. 14

Unit - V

5. (a) What is high shear case in the beam design? 2

(b) A simply supported beam of span 4·5 m consists of a ISLB 450 @ 640 N/m. The compression flange is laterally unsupported. Determined the design bending strength of the beam. 14

(c) Design a laterally supported simply supported beam of span 4 m loaded for a concentrated load of 400 kN at mid-span. The load is transferred through base plates of 200 mm length to the supports. Check for shear and deflection also. 14