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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution under VTU, Belgaum)

Seventh Semester, B.E. – Civil Engineering

Semester End Examination; Dec. - 2014

Design of Steel Structures

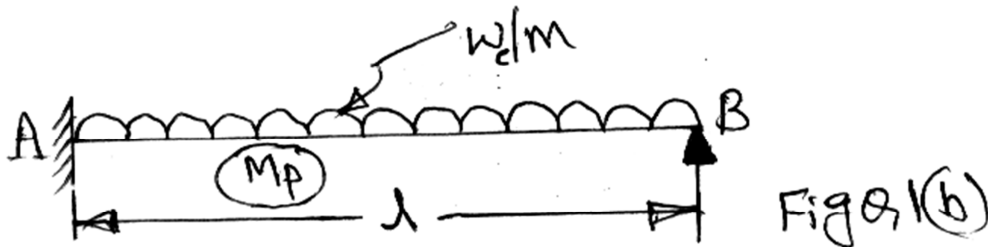
Time: 3 hrs

Max. Marks: 100

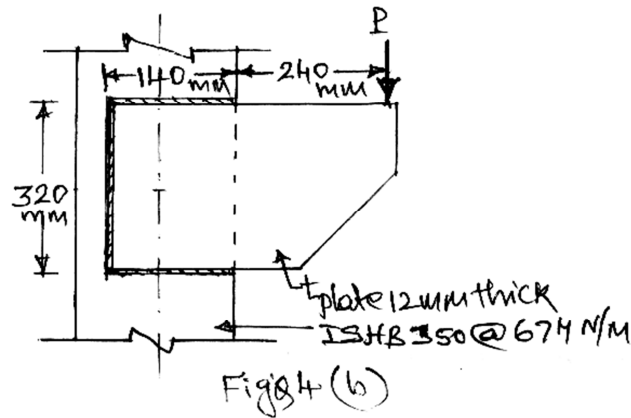
- Note:** i) Answer any **FIVE** full questions, selecting at least **TWO** full questions from each part.
ii) IS : 800 –2007, steel table are permitted.

PART – A

- 1 a. A hollow box section of outer dimensions 300 mm width x 600 mm depth is made up of 12 mm thick plate throughout. Determine its shape factor and plastic moment capacity take $f_y = 250 \text{ N/mm}^2$. 10
- b. Determine the position of plastic hinge from support B for the beam shown in Fig. Q 1(b) and the magnitude of collapse load. 10



- 2 a. What is rolled structural steel sections? Write the various types of rolled steel sections manufacturing. 6
- b. Mention advantages and disadvantages of steel structures. 6
- c. Explain briefly how limit state method differs from working stress method of design. 8
- 3 a. Explain the various modes of failure of bolted connections with neat sketches. 6
- b. Design a bolted connection between the flange of a column ISHB 450 @ 907 N/m and a bracket plate 15 mm thickness. The bracket plate is supporting a load of 150 kN at an eccentricity of 350 mm. Adopt 20 mm dia HSBG bolts of property class 8.8 ($f_{yb} = 640 \text{ N/mm}^2$, $f_{ub} = 800 \text{ N/mm}^2$ and $f_u = 410 \text{ N/mm}^2$) 14
- 4 a. Explain the common defects in the welded connections. 6
- b. Calculate the load that can be transmitted through the eccentric welded connection shown in Fig. Q 4(b). Use size of weld is 6 mm. 14



PART – B

- 5 a. What is a lug angle? Explain in brief, with a neat diagram. 5
- b. An ISA 100 x75x6 mm is connected to 10 mm thick gusset plate with 6 – 16 mm dia, bolts to transfer tension. Determine design tensile strength if longer leg is connected to gusset plate. Take pitch and edge distance 40 mm. 15
- 6 a. How does the behavior of a compression member differ based on its length? 5
- b. Calculate the compressive strength of a built – up column consisting of ISHB 300 @ 630 N/m with one cover plate 350x20 mm on each flange and having length of 5 m. Assume that the bottom of the column is fixed and top is also fixed, take $f_y = 250 \text{ N/mm}^2$. 15
- 7 a. Define column base; write the types of column bases used. 5
- b. A column ISHB 300 @ 630 N/m with one cover plate 400x20 mm on each flange of a column is carrying an axial load of 1800 kN. Design gusseted base. Assume M_{20} concrete and $\sigma_y = 260 \text{ N/mm}^2$ and partial safety factor for load 1.5. Gusset plate is 16 mm thick and gusset angles are ISA 150x115x15 mm. 15
- 8 a. Write a note on laterally supported and laterally unsupported. 5
- b. Determine:
- Design bending strength,
 - Design shear strength
 - Intensity of UDL the beam can carry under service conditions
 - Max. deflection for a simply supported 5m steel beam ISMB 400 @ 616 N/m. Assume $f_y = 250 \text{ N/mm}^2$.
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