Reg. No. : | | | | | | | | | | |

Question Paper Code: 52262

M.E. DEGREE EXAMINATION, JUNE 2016

Second Semester

Structural Engineering

15PSE202 - STEEL STRUCTURES

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

(Relevant IS codes are permitted)

PART A - (5 x 1 = 5 Marks)

1. The effective length of a compression member of length *L* held in position and restrained in direction at one end and effectively restrained in direction but not held in position at the other end is

   (a) *L* (b) 0.67 *L* (c) 0.85 *L* (d) 1.5 *L*

2. If the pitch is 6 *cm* and rivet value is 4 *tonnes,* the number of rivets required for a riveted connection carrying an eccentric load of 15 *tonnes* at a distance of 30 *cm* from the centre line is

   (a) 6 (b) 8 (c) 10 (d) 12

3. In plastic analysis, the shape factor for circular sections is

   (a) 1.5 (b) 1.6 (c) 1.697 (d) None of these

4. The critical stress on a column for elastic buckling given by Euler's formula is

(a) $f_c = \frac{\pi^2 E}{(l/r)^2}$ (b) $f_c = \frac{(l/r)}{\pi E}$

(c) $f_c = \frac{(l/r)^2}{\pi E}$ (d) $f_c = \frac{\pi^2 E}{(l/r)}$

5. According to IS:800 - 1971, the minimum thickness of a vertically stiffened web plate, shall not be less than

(a) $\frac{d}{85}$ (b) $\frac{d}{225}$ (c) $\frac{d}{200}$ (d) $\frac{d}{250}$

PART B - (5 x 3 = 15 Marks)

6. Why the lateral systems are provided in compound columns?

7. Why does buckling of web occur in beams?

8. Name the different modes of failure of a riveted joint?

9. List the special consideration required to be full filled while attempting to a plastic design.

10. Draw a neat sketch of stiffened seat connection and name its parts.

PART C - (5 x 16 = 80 Marks)

11. (a) Design a gantry girder to be used in an industrial building carrying an EOT crane for the following data:

Total self-weight of all components = 240 *kN*.

Minimum approach at the carne hook of gantry girder = 1.2*m*

Wheel base = 3.5*m* C/C distance between gantry rails = 16*m* C/C distance between columns = 8*m*

Self-weight of rail section = 300 *N/m*

Yield stress = 250 N/mm^2

Design the main gantry section. Connection design not required. (16)

Or

(b) A column ISHB 350 @ 66.1 *N/m* carries an axial compressive factored load of 1700 *kN*. Design a suitable bolted gusset base. The base rests on M15 grade of concrete pedestal. Use 24 *mm* diameter bolts of grade 4.6 for making connections. (16)

12. (a) (i) Calculate number of bolts required to transfer a factored axial force of 100 *kN* through a bolted connection using 12 *mm* bolts in single shear with plate thickness of 8 *mm*. (8)

(ii) Differentiate between fillet weld and butt welded joints. (8)

Or

(b) Design the connections at the end of a beam ISLB 350 having 8.5 *m* span carrying a total UDL of 350 *kN* with the flange of the column ISHB 200 at 40 *kg/m*. Use 20 *mm* diameter bolts.

(i) Use stiffened connection

(ii) Use unstiffened seat connection (16)

13. (a) Design a roof truss for an industrial building with 25 *m* span and 120 *m* long. The roofing is galvanized iron sheeting. The basic wind speed is 50 *m/s* and terrain is open industrial area and building is class *A* building. The building clear height at the eaves is 9 *m*. (16)

Or

(b) Design a composite truss of span 10.0 *m* with following data: DATA: Span = l = 10.0 *m* Truss spacing = 3.0 *m* Slab thickness = *Ds* = 150 *mm* Profile depth = *Dp* = 75.0 *mm* Self weight of deck slab = 2.80 kN/m^2 Maximum laterally un-restrained length in top chord is 1.5 *m*. Grade of concrete, M20 = *(fck)cu* = 20 *MPa*. (16)

14. (a) Find Mp for the portal frame with electrically operated travelling crane as shown in Figure 1 by 'Reactant moment diagram' method. The roof pitch is 30 *q*. Neglect the effect of wind acting vertically on the roof. Horizontal wind pressure is = 1 Kn/m^2 *Jf* = 1.2 for the combined effects of wind, crane, dead load and live load. (16)

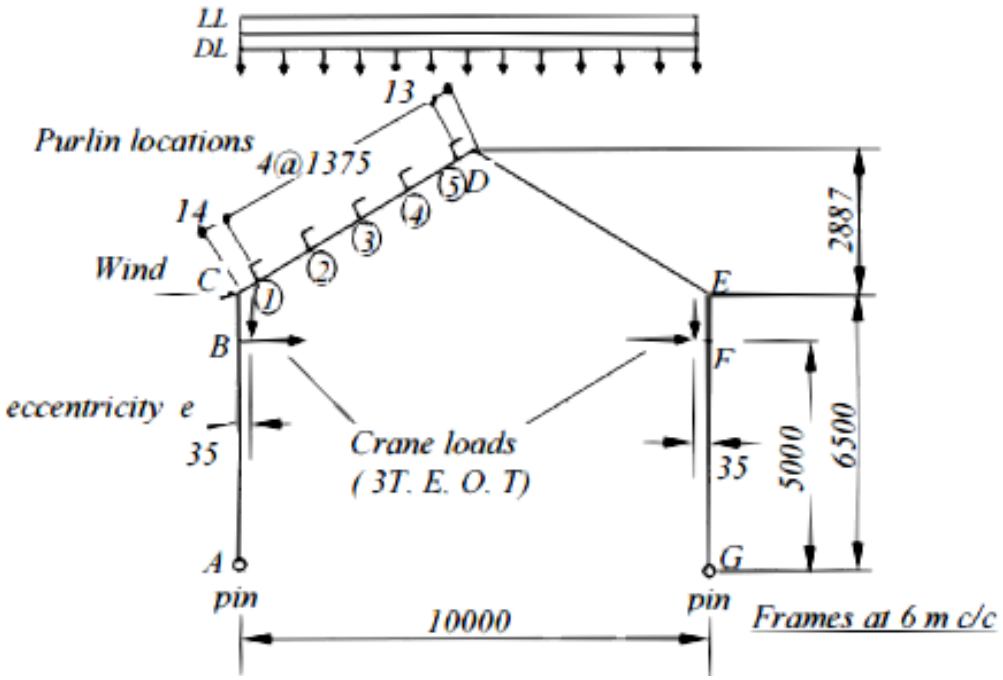

Figure 1

Or

(b) Enumerate the factors on which fully plastic moment is dependent. Discuss influence of shear force on fully plastic. Moment of a beam of rectangular section. (16)

15. (a) Why is light gauge steel used in structural applications? Explain its uses and applications. (16)

Or

(b) A simply supported beam of effective span length of 7 *m* is laterally supported throughout. It carries an uniformly distributed load of 45 *kN/m* (including self-weight). Design the appropriate light gauge steel section as per requirement. (16)