Total No. of Questions : 8]

SEAT No. : ____

PA-1424

[Total No. of Pages : 2

[5926]-40

T.E. (Civil)

DESIGN OF STEEL STRUCTURES

(2019 Pattern) (Semester - I) (301003)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 Q.8.***
2) ***Neat sketches must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Take f_y = 250 and f_e = 410 grade of steel.***
5) ***Take ultimate stress in bolt, f_{ub} = 400 N/mm^2.***
6) ***Assume suitable data, if necessary.***
7) ***Use of electronic pocket calculator, IS : 800-2007 and steel table are allowed.***
8) ***Use of cell phone is prohibited in the examination hall.***

Q1) a) State and explain in brief type of column bases. **[3]**

b) Check the adequacy of ISHB 450 @ 85.4 kg/m to carry a factored axial load of 750 kN at an eccentricity of 270 mm about major axis. The effective length of column is 3 m. Consider only section strength. **[14]**

OR

Q2) a) Find buckling class of section ISHB 400 @ 77.4 kg/m used as a column. **[3]**

b) A column consist of section ISHB 350 @ 67.4 kg/m carries an axial compression factored load of 1700 kN. Design a suitable bolted gusseted base. The base is rest on M20 grade of concrete pedestal. Use 20 mm diameter bolts for the connection. **[14]**

Q3) a) Explain in brief how lateral support is provided to the compression flange of beams with suitable sketches. **[4]**

b) A simply supported beam carries a uniformly distributed load of magnitude W kN/m on entire span of 6 m. The compression flange is *laterally unsupported* throughout the span. Find the intensity of uniformly distributed load the section ISMB 500 @ 89.6 kg/m can carry for the beam safely. Both ends of beam are fully restrained against torsion. **[14]**

OR

Q4) a) Classify the section ISLB 500 @ 75.0 kg/m and ISA 100 × 75 × 8 mm @ 10.5 kg/m used as a beam. **[4]**

b) Design a suitable I-section for a simply supported beam of span 6 m carrying a dead load 20 kN/m and live load 40 kN/m. The beam is *laterally supported* throughout the span. **[14]**

P.T.O.

Q5) Determine panel point dead load, imposed load and wind load for a truss as shown in Figure 1. Assume design wind pressure as 1100 N/m^2, use G.I. Sheet and the centre to centre spacing of truss as 4 m. Assume self-weight of purlin 120 N/m. **[17]**

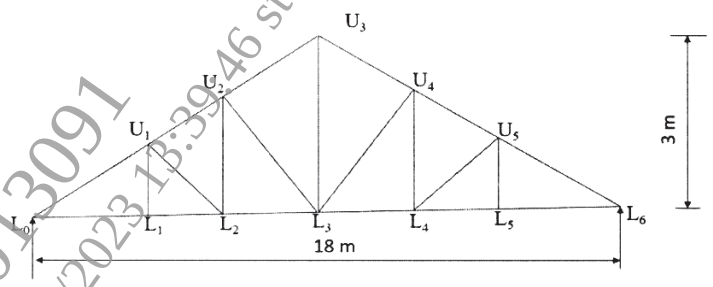

Figure 1

OR

Q6) Design a gantry girder to be used in an industrial building carrying a manually operated overhead travelling crane, for the following data: **[17]**

a) Crane capacity 200 kN
b) Self-weight of the crane girder excluding trolley 200 kN
c) Self-weight of the trolley, electric motor, hook, etc. 40 kN
d) Minimum approach of the crane hook to the gantry girder 1.20 m
e) Wheel base 3.5 m
f) Span of crane girder 16 m
g) Span of gantry girder = 8 m
h) Self-weight of rail section 300 N/m

Q7) a) Explain in brief IS provisions for length and spacing of intermittent weld. **[4]**

b) A Simply supported welded plate girder of span 30 m is subjected to uniformly distributed load 30 kN/m on whole span excluding self weight of plate girder. Design cross section of plate girder. Assume compression flange is laterally supported throughout the span. **[14]**

OR

Q8) a) Explain in brief flange curtailment of plate girder. **[4]**

b) A simply supported welded plate girder is designed for the span of 24 m. It is subjected to a shear force of 2300 kN and bending moment of 20700 kNm. A section used for plate girder to carry above load is as given below - **[14]**

Flanges - 780 mm wide and 50 mm thick

Web - 16 mm thick and 2600 mm deep

Design intermittent welded connection between flange and web. Also design end bearing stiffener.