Reg. No. :

Question Paper Code : X 20312

B.E./B.Tech. DEGREE EXAMINATIONS, NOV./DEC. 2020
Sixth Semester
Civil Engineering
CE 6603 – DESIGN OF STEEL STRUCTURES
(Regulations 2013)
(Common to PTCE 6603 – Design of Steel Structures for B.E. (Part-time) – Fourth Semester – Civil Engineering – 2014)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Draw the stress-strain curve for mild steel bar showing the salient points.
2. List out the failure of bolted joint.
3. Give some examples of tension members.
4. What is the use of providing lug angles ?
5. What is meant by a strut ?
6. What are the assumptions made in Euler's analysis ?
7. Define shape factor.
8. What is meant by limit state design ?
9. Why should the purlins be placed at the panel points ?
10. List any two unique forces that act on gantry girders.

PART – B **(5×13=65 Marks)**

11. a) Two plates 10 mm and 14 mm thick are to be jointed by double cover butt joint. Assuming cover plates of 8 mm thickness, design the joint to transmit a factored load of 300 kN. Assume Fe410 plate and 16 mm diameter bolt of grade 4.6.

(OR)

b) A tie member of a truss consist of an angle section ISA 65 × 65 × 6 mm of Fe 410 grade is welded to an 8 mm gusset plate. Design a suitable weld to transmit a load equal to full strength of the member, providing

a) weld on two sides of the angle

b) weld on all three sides. Assume shop welding.

12. a) Determine the tensile strength of a roof truss diagonal 100 × 75 × 10 mm connected to the gusset plate by 4 Nos. of 20 mm diameter power driven rivets in one row along the length of the member. The short leg of the angle is kept outstanding.

(OR)

b) A bridge truss diagonal carrier an axial bull of 300 kN. Two mild steel flats 250 ISF 10 and ISF 18 of the diagonal are to be joined together. Design a suitable splice.

13. a) Calculate the compressive resistance of a compound column consisting ISMB 500 with one cover plate 350 × 20 mm on each flange and having a length of 5 m. Assume that the bottom of column is fixed and top is rotation fixed, translation free. Take f_y = 250 N/mm^2.

(OR)

b) A steel column ISHB 400 @ 759.3 N/m is subjected to a factored axial load of 2000 kN. Design a slab base plate for the column. Assume that the bearing surfaces of the column and base plate are machined and the concrete footing is of M 20 grade.

14. a) A built-up I-section has the following dimensions : Flanges : 250 × 6 mm ; Web : 300 × 3 mm. Calculate the plastic section modulus and plastic moment capacity of the section. Also find the shape factor.

(OR)

b) An ISMB 400 transfers an end reaction of 160 kN to the flange of an ISHB 300 @ 577 N/m. Design an unstiffened welded seat connection. Take fb = 185 N/mm^2.

15. a) A gantry girder section is shown in Figure Q.15 (a). The girder is subjected to the following moments.

Moment about the major axis, M_z = 600 kNm

Moment about the minor axis M_y = 25 kNm.

Check the adequacy of the girder for combined local capacity if

$Z_{ey} = 580.92 \times 10^3$ mm^3

$Z_{ez} = 3764.98 \times 10^3$ mm^3

$Z_{py} = 824.76 \times 10^3$ mm^3

$Z_{pz} = 4767.98 \times 10^3$ mm^3

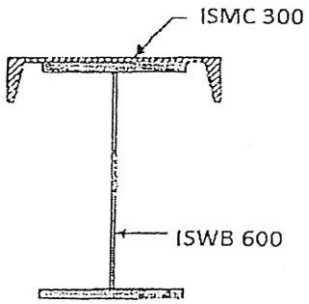

Figure Q.15 (a)

(OR)

b) An industrial building with the following details is situated in Chennai

Spacing of the truss c/c = 5 m

Span of the truss = 10 m

Spacing of purlins = 1.5 m

Weight of GI sheets = 130 N/m^2

Slope of the truss = 30°

Intensity of wind pressure = 2 kN/m^2

Design an I-section purlin for this roof truss.

PART – C **(1×15=15 Marks)**

16. a) Design a bridge compression member of two channels connected toe to toe. The length of the member is 8 m. It carries a load of 1250 kN. The width over the backs of channel is 40 cm. If the channels are connected by battens. Design a suitable section.

(OR)

b) A principal rafter in a roof truss has an effective span of 2 m. It has to support a compressive force of 60kN due to dead load, a compressive force of 70 kN due to live load and a tensile force of 120 kN due to wind load. Design the rafter.