C **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: U6102

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2024

Sixth Semester

Civil Engineering

21UCE602- DESIGN OF STEEL STRUCTURES

(Regulations 2021)

(Use of IS 800:2007, SP 6-1:1964, Steel Tables, IS: 875 (Part I to V) - 1987(Reaffirmed 2003) codes are permitted)

Duration: Three hours Maximum: 100 Marks

Answer All Questions

PART A - (5 x 1 = 5Marks)

1. If the thickness of thinnest outside plate is 10 mm, then the maximum pitch of bolts in tension will be taken as CO2 - App

   (a)120 mm (b)160 mm (c) 200 mm (d) 300 mm

2. Find the thickness of flange and thickness of web for the channel section ISMC 250, Use SP 6-1:1964 code book. CO2 - App

   (a) t_f=14.1mm &t_w=7.1mm (b) t_f=13.1mm &t_w=8.2mm

   (c) t_f=15.8mm &t_w=9.0mm (d) t_f=13.7mm &t_w=6.9mm

3. If the unsupported length of a stanchion is 4 metres and least radius of gyration of its cross-section is 5cm, the slenderness ratio of the stanchion is CO3 - App

   (a) 60 (b) 70 (c) 80 (d) 100

4. Which of the following buckling does not occur in beam? CO1 - U

   (a) lateral buckling of whole beam (b) local buckling of web

   (c) local buckling of flanges (d) longitudinal buckling of web

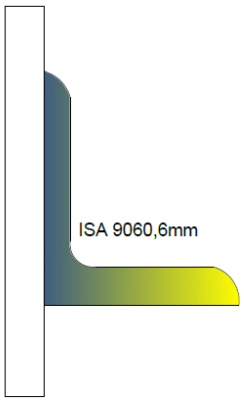
5. What is the section modulus required to design an angle purlin which experience a maximum bending moment of 10kNm, if the section is made up of Fe250 grade steel? CO3 - App

   (a) 45.57 cm^3 (b) 50.52 cm^3 (c) 49.37 cm^3 (d) 48.28 cm^3

PART – B (5 x 3= 15 Marks)

6. Calculate the design strength due to yielding of the plate of size 130mm x 12mm with the holes for 16mm dia bolts. Use Fe415 grade steel. CO2 - App

7. Calculate the gross area of the given angle section as shown in fig. CO3 - App



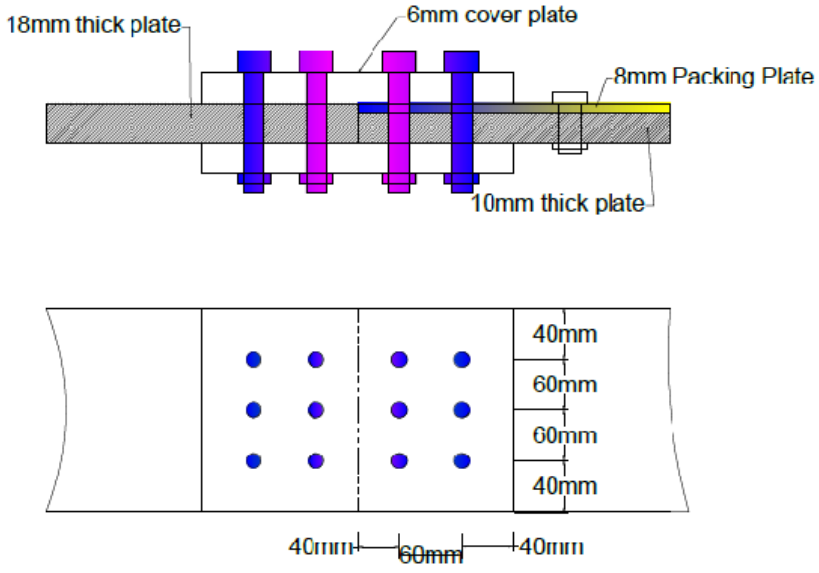
8. Calculate the sectional properties for ISA7575, 6mm channel section as per codal provisions. CO3 - App

9. Determine the shape factor for a rectangular section of depth 'd' and width 'b' CO2 - App

10. Calculate the design wind speed of the industrial structures for the following data, k_1=1.06,k_2=0.93, k_3=1.36 &V_b=39m/sec. CO3 - App

PART – C (5 x 16= 80Marks)

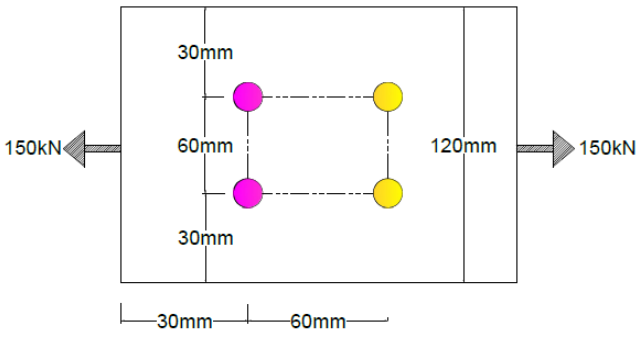
11. (a) Two cover plates 10mm and 18mm thick are connected by a double cover butt joint using 6mm cover plates as shown in fig. Analyse the strength of the given joint. Assume the material grades and diameter of the bolt. CO4 - Ana (16)



Or

(b) A tie member of a roof truss consists of 2ISA10075, 8mm. the angles are connected to either side of a 10mm gusset plates and the member is subjected to a working pull of 300kN. Analyse the strength of welded connection. Assume the connections are made in the workshop. CO4 - Ana (16)

12. (a) Determine the design tensile strength of the plate 120mm x 10mm with the holes for 18mm diameter bolt as shown in fig. Use Fe415 grade steel materials. CO2 - App (16)

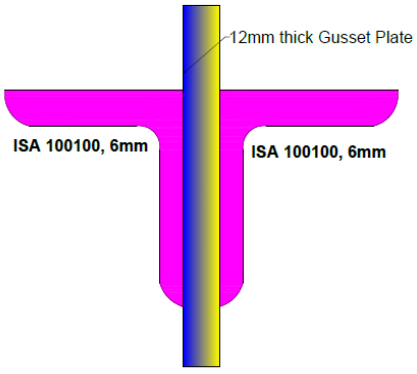


Or

(b) Determine the design tensile strength of a splice to connect a 300mm x 20mm plate with a 300mm x 10mm plate. The design load is 500kN. Use 20mm black bolts, fabricated in the shop. CO2 - App (16)

13. (a) In a truss of a strut is 3m long consists of two angles ISA100100, 6mm. Analyse the factored strength of the member if the angles are connected on both sides of 12mm gusset by, CO5-Ana (16)

i. One bolt
ii. Two bolts
iii. Welding, which makes the joint rigid?



Or

(b) Design a laced column with two channels back to back of length 10m to carry an axial factored load of 1400kN. The column may be assumed to have restrained in position but not in direction at both ends. (Hinged ends) CO5-Ana (16)

14. (a) Design a simply supported beam of span 7m carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The total UDL is made up of 100kN dead load including self-weight plus 150kN imposed load. In addition the beam carries a point load at mid span made up of 50kN dead load and 50kN imposed load. Take a stiff bearing length of 75mm. CO2 - App (16)

Or

(b) Design a simply supported steel joist of 5 m effective span, carrying a uniformly distributed load 12 kN/m if compression flange of the joist is laterally unrestrained. CO2 - App (16)

15. (a) Design an I-section purlin for an industrial building to support a galvanized corrugated iron sheet roof.
Spacing of the trusses =5.0m
Spacing of purlins =1.5m
Inclination of main rafter of horizontal=30^{o}
Weight of galvanized sheets taking into account laps and connecting bolts =130N/m
Imposed snow load =1.5kN/m^2
Wind load =1.0kN/m^2, suction. CO4- Ana (16)

Or

(b) Design a simply supported gantry girder to carry an electric overhead travelling crane, given:
Span of gantry girder = 6.5m
Span of crane girder =16m
Crane capacity = 250kN
Self-weight of crane girder excluding trolley = 200kN
Self-weight of trolley = 50kN
Minimum hook approach = 1.0m
Distance between wheels = 3.5m
Self-weight of rails = 0.3kN/m CO4- Ana (16)