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Question Paper Code: U6102

B.E./B.Tech. DEGREE EXAMINATION, NOV 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

PART A - (5 x 1 = 5 Marks)

1. Partial Safety factor for resistance governed by yielding γ_{mo} as per IS   CO1-U
   code is

   (a) 1.10   (b) 1.25   (c) 1.50   (d) 1.15

2. In a lap joint, at least _____ bolts should be provided in a line.   CO1-U

   (a) 0   (b) 1   (c) 2   (d) 3

3. As per IS specifications the buckling class of a Rolled I Section about   CO1-U
   y-y axis if $h/b_f > 1.2$ and $t_f \leq 40$ mm

   (a) d   (b) a   (c) b   (d) c

4. What is the value of the imperfection factor for buckling class a?   CO1-U

   (a) 0.35   (b) 0.73   (c) 0.21   (d) 0.23

5. A column splice is used to increase   CO1-U

   (a) Length of the column   (b) Strength of the column

   (c) Cross sectional area of the column   (d) Cross sectional dimension of the column

11. Sketch and define the pitch(p), gauge(g), staggered pitch (Ps) edge distance(e)– CO1-U
Use IS 800 – 2007.

12. Calculate the design strength due to rupture of critical section of the plate of   CO2-App
size 120mm x 10mm with the holes for 18mm dia bolts. Use Fe415 grade steel.

13. Write the short notes on compression members and its importance's.   CO1-U

14. What you mean by flexural member and its types?   CO1-U

15. What are the major components of industrial buildings?   CO1-U

PART – C (5 x 16= 80Marks)

16. (a) A boiler shell is made up of 14mm thick Fe415 plates. If the joint   CO4-Ana   (16)
is double bolted lap joint with M16 bolts of grade 4.6 at distances
of 50mm, estimate the design strength of the joint per pitch width.
Is it a safe design for the following conditions,

    i.   If internal diameter of bolt is 1m & team pressure is
       1.2MPa.
    ii. If internal diameter of bolt is rise 2m for the same steam
       pressure.

Or

(b) Design the following joints between two plates of width 200 mm   CO4-Ana   (16)
and thicknesses 10 mm and 18 mm respectively to transmit a
factored load of 150 kN. Analyze the efficiency of connection
with double cover butt joint with cover plate of 6 mm. Assume
the grade of bolt and plate values.

17. (a) Determine the design tensile strength of the plate 130mm x 12mm   CO2-App   (16)
with the holes for 20mm diameter bolt as shown in fig. Use
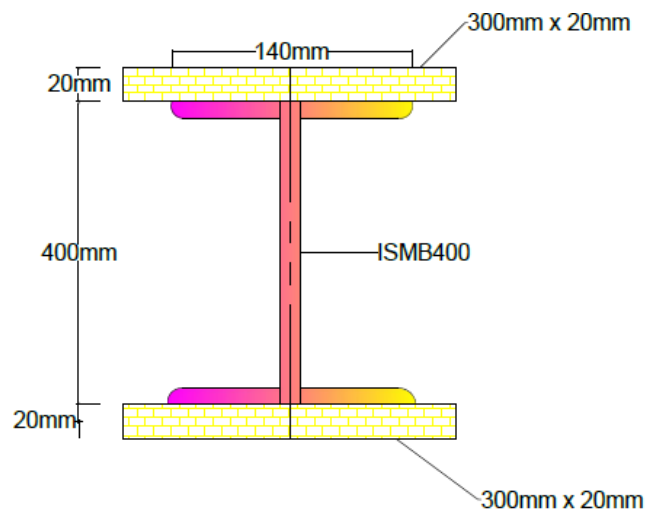Fe415 grade steel materials.

Or

2

U6102
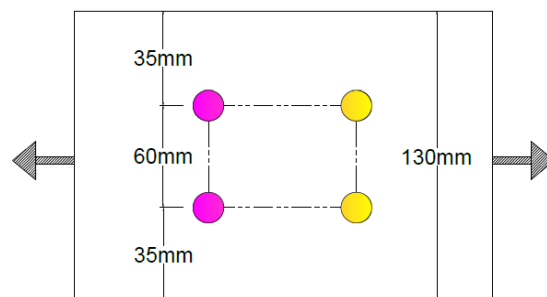
(b) Calculate the tensile strength of the steel plate of dimensions of width 150mm and thickness 15mm with the diameter of bolt holes is 18mm. Totally 4 nos of bolt arrange in the connection and each row carries a two bolt of centre to centre distance is 60mm both transverse and longitudinal direction. Take the end distance is 35mm. Use Fe415 grade steel.　CO2-App　(16)

18. (a) Design a single angle section of strut connected to the gusset plate to carry 180kN factored load. The length of the strut between centre to centre intersections is 3m. Analyse the dimensions of the structural steel angle member as per codal provisions.　CO5-Ana　(16)

Or

(b) Analyse the load carrying capacity of the column section loaded as shown in fig. If its actual length is 4.5m. Its one end may be assumed fixed and the other end hinged. The grade of steel is Fe415.　CO5-Ana　(16)


19. (a) Design a simply supported beam of span 5m carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The UDL is made up of 20kN/m imposed load and 20kN/m dead load. Use Fe410 grade steel material for connections.　CO5-Ana　(16)

Or

U6102

(b) Analyse the sectional properties and safety of for the given simply supported beam loaded as shown in fig.   CO5-Ana   (16)
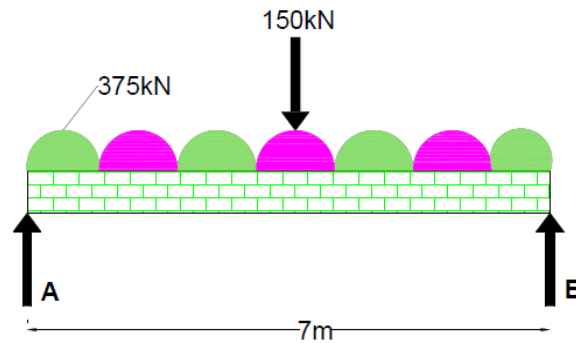
20. (a) A roof truss shed is to be built in Lucknow for an industry. The size of shed is 24m x 40m. The height of building is 12m at the eves. Determine the basic wind pressure.   CO3-App   (16)

Or

(b) A power plant structure having maximum dimension more than 60m is proposed to be built on downhill side near Dehradun. The height of the hill is 400m with a slope of 1in3. If the location is 250m from the crest of the hill downward slope and its eve board is at a height of 9m, determine the design wind pressure.   CO3-App   (16)

U6102