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Reg. No. :

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Question Paper Code: 56103

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2022

Sixth Semester

Civil Engineering

15UCE603- DESIGN OF STEEL STRUCTURES

(Regulation 2015)

Use of IS 800:2007, IS 875 (Part I, II & III,IV & V):1987 and SP 6-1:1964 are permitted

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Duration: Three hours   Maximum: 100 Marks

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Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

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1. _____ connections develop the full moment capacity of   CO1-R
    connecting members and retain the original angle between the members under
    any joint rotation.

    (a) Simple   (b) Rigid   (c) Semi rigid   (d) Rivetted

2. Tension members in form of _____ steel rods are often used to   CO2-R
    strengthen existing structures by attaching them to the bottom flange or the
    chord of the structure.

    (a) high strength   (b) low strength   (c) medium strength   (d) very low strength

3. The vertical compression members are called as _____.   CO3-R

    (a) Boom   (b) Rafter   (c) Struts   (d) Posts

4. The second order moments in beam columns may be due to _____.   CO4-R

    (a) Joint effects   (b) Connection effects   (c) Load effects   (d) Member effects

5. _____ is defined as the space between two adjacent bents.   CO5-R

    (a) Effective length   (b) Bay   (c) Bent   (d) Purlin

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PART – B (5 x 3= 15Marks)

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6. Brief a note on the working stress design philosophy.   CO1-R

7. Sketch any two cross section of a typical tension members.   CO2-R

8. Write a note on the flexural buckling and effective length factor.   CO3-R

9. Quote the significance of lateral torsional buckling. CO4-U

10. List any four points that a structural engineer has to consider during the planning CO5-R
    and design of industrial buildings.

PART – C (5 x 16= 80Marks)

11. (a) Design a connection to joint two plates of size 250 x 12 mm of CO1-App (16)
       grade Fe 410, to mobilize full plate tensile strength using shop
       fillet weld, if
       (i) a lap joint is used
       (ii) double cover butt joint is used

Or

    (b) Design a seat angle connection between a beam MB 300 and CO1-App (16)
       column SC 200, for a reaction of beam 100 KN, using M20 bolts
       of property class 4.6. Take Fe 410 grade steel (f_y = 250 MPa.)

12. (a) A single unequal angle 100 x 75 x 6 mm is connected to a 10 mm CO2-App (16)
       thick gusset plate at the ends with six 16 mm diameter Bolts to
       transfer tension. Determine the design tensile strength of the angle
       assuming that the yield and the ultimate stress of Steel used are
       250 MPa 410 MPa.
       (i) if the gusset is connected to the 100 mm leg.
       (ii) if the gusset is connected to the 75 mm leg.

Or

    (b) Design a connection to joint two plates of size 250 X 12mm of CO2-App (16)
       grade Fe410, to mobilize full plate tensile strength using shop fillet
       welds, if

       (i) lap joint is used

       (ii) a double cover butt joint is used.

13. (a) Determine the design axial load on the column section ISMB 350, CO3-App (16)
       given that the height of the column is 3 m and that it is pin ended.
       Also assume the following: Fy=250N/mm^2; Fu=410 N/mm^2;
       E=2 X 105 N/mm^2

Or

    (b) Write the step by step procedure with respective formulae for CO3-U (16)
       design of single section and compound section compression
       members.

14. (a) Design a simply supported beam of span 4m carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The UDL is made up of 20 KN/m imposed load and 20 KN/m dead load (section is stiff against bearing). Assume Fe 410 grade steel. CO4-App (16)

Or

(b) Give the step by step procedure for the design of beam columns with its suitable formulae. CO4-U (16)

15. (a) Determine the moments and forces due to the vertical and horizontal lads acting on a simply supported gantry girder given the following data. CO5- E (16)

   1. simply supported span = 6m

   2. crane's wheel centre's = 3.6m

   3. self-weight of the girder = 1.5KN/m

   4. maximum crane wheel load = 220 KN

   5. weight of crab/trolley = 60 KN

   6. Maximum hook load = 200 KN.

Or

(b) Design a purlin of a roof truss for an industrial building located at Chennai with a span of 20m and a length of 50m. The roofing is galvanized iron sheeting. Basic wind speed is 50m/s and the terrain is an open industrial area. Building is class B building with a clear height of 8m at the eaves. CO5- E (16)

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