USN ☐☐☐☐☐☐☐☐☐☐ **10CV72**

Design of Steel Structures

Time: 3 hrs. Max. Marks:100

Note: 1. *Answer FIVE full questions, selecting at least TWO questions from each part.*
2. *Use of IS: 800-200 and steel tables is permitted.*

<div align="center">

PART – A

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1 a. Describe briefly advantages and disadvantages of steel structures. **(05 Marks)**
   b. What are the different loads and load combinations to be considered in the design of steel structure. **(05 Marks)**
   c. Explain rolled steel sections. What are the different types of rolled steel section used in construction? **(06 Marks)**
   d. Explain briefly the limit state method of design of steel structure. **(04 Marks)**

2 a. Briefly explain different types of bolts. **(04 Marks)**
   b. Determine the safe load P that can be carried by the bracket. The bracket plate is of 10mm thick M20 bolt of grade 5.6 are used. **(16 Marks)**
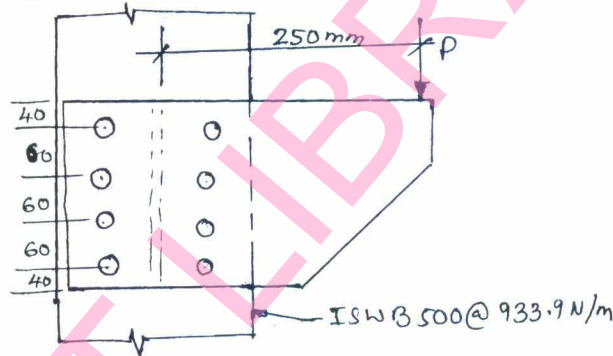

Fig Q2(b)

3 a. Describe briefly advantages and disadvantages of welded connection. **(04 Marks)**
   b. What are the common defects in welding? Explain with neat sketch. **(06 Marks)**
   c. A tension member consists of 2ISA 100×75×8 carries a factored tensile load of 300kN. The angles are connected to a 10mm thick gusset plate with longer legs placed back to back on either side of gusset plate. Design the joint assuming shop welding and only side weld are provided. **(10 Marks)**

4 a. Define i) Plastic hinge   ii) Mechanism   iii) Shape factor. **(06 Marks)**
   b. Find out the collapse load for a propped cantilever subjected to a concentrated load at the midspan of the beam using upper bound theorem. **(04 Marks)**
   c. Determine the plastic moment capacity (M_P) for the beam loaded as shown in Fig Q4(c). Use load factor 1.6. **(10 Marks)**
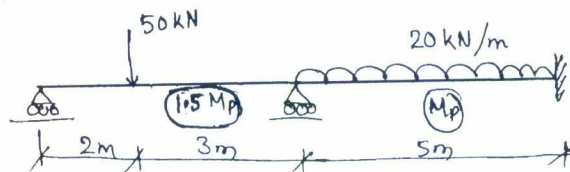

Fig Q4(c)

PART – B

5   a.   Explain different forms of tension members commonly used in steel structures.   (04 Marks)
    b.   Design a single unequal angle tension member to carry a factored load of 300kN. The length of the member is 3.0m. The tension member is connected to a gusset plate of 16mm thick with one line of M20 bolts of grade 8.8. Take pitch = 60mm and edge distance = 40mm. use steel of Fe 410.
                                                                                    (16 Marks)

6   a.   Calculate the design strength of discontinuous strut of length 3.2m. The strut consists of two unequal angles $100 \times 75 \times 8$ with longer legs placed back to back on either side of 10mm thick gusset plate. Assume steel of grade Fe 410.   (06 Marks)
    b.   Design a single lacing system for a column 8m long consists of 2 ISMC 300 placed back to back such that $I_{zz} = I_{yy}$. The column is subjected to factored load of 1250kN and is hinged at both ends. Assume steel of grade Fe 410 and bolts are of grade 4.6.   (14 Marks)

7   Design a suitable bolted gusseted base for a built up column consists of ISHB 350@ 661.2N/m with cover plate of 400mm × 20mm on either flange carrying a axial compressive factored load of 2400kN. The box rests on M20 grade of concert pedestal. Use M24 bolts of grade 5.6 for making connection. Sketch the details.   (20 Marks)

8   Design a steel beam for supporting RC slab with clear span of 5.0m thickness of end bearing wall 230mm. total service load acting on this floor is 10kN/m^2. The beams are provided at 3.5m C/C. The compression flange is laterally supported throughout its length. Design should satisfy all necessary checks.   (20 Marks)

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Seventh Semester B.E. Degree Examination, June/July 2017
Design of Pre-Stressed Concrete Structures

Time: 3 hrs.

Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting
atleast TWO questions from each part.
2. Use of IS : 1343 – 1980 is permitted.
3. Missing data, if any, may be suitably assumed.

PART – A

1 a. Explain why high strength steel and high strength concrete are used in pre-stressed concrete. **(08 Marks)**

   b. Define pre-stressed concrete. State its advantages over reinforced concrete. **(06 Marks)**

   c. What is pressure line? Explain its significance. **(06 Marks)**

2 a. Distinguish between the pre-tensioning and post-tensioning methods of pre-stressing. Explain with suitable example. **(06 Marks)**

   b. A pre-stressed concrete beam, 200 mm wide and 300mm deep is used over an effective span of 6m to support an imposed load of 4 kN/m. The density of concrete is 25 kN/m^3. At the quarter span section of the beam, find the magnitude of :
   i) Concentric pre-stressing force necessary for zero fibre stress at the soffit when the beam is fully loaded
   ii) The eccentric pre-stressing force located 100mm from the bottom of the beam, which would nullify the bottom fibre stress due to loading. **(14 Marks)**

3 a. List and explain the various types of loss of pre-stress in pre-tensioned and post-tensioned members. **(06 Marks)**

   b. A post tensioned concrete beam, 100mm wide and 300mm deep, spanning over 10m is stressed by successive tensioning and anchoring of three cables 1, 2 and 3 respectively. The cross-sectional area of each cable is 200mm^2 and initial stress in cable is 1200 N/mm^2. Modular ratio = 6. The first cable is parabolic with an eccentricity of 50mm below centroidal axis at the center of span and 50mm above centroidal axis at support sections. The second cable is parabolic with zero eccentricity at supports and an eccentricity of 50mm at the centre of span. The third cable is straight with a uniform eccentricity of 50mm below centroidal axis. Estimate percentage loss of stress in each of the cables, if they are successively tensioned and anchored. **(14 Marks)**

4 a. What are the factors influencing deflections of a PSC beam? **(06 Marks)**

   b. A concrete beam with a cross-sectional area of 32×10^3 mm^2 and radius of gyration of 72mm is pre-stressed by a parabolic cable carrying an effective stress of 1000 N/mm^2. The span of the beam is 8m. The cable, composed of 6 – 7mm diameter, has an eccentricity of 50mm at the center and zero at the supports. Neglecting all losses, find the central deflection of the beam as follow :
   i) Self – weight + pre-stress, and
   ii) Self-weight + pre-stress + live load of 2 kN/m. Take E = 38 kN/mm^2 and density of concrete 24 kN/m^3. **(14 Marks)**

PART – B

5 a. What are the different types of flexural failure modes observed in pre-stressed concrete beam? Explain with neat sketches. **(06 Marks)**

   b. A post-tensioned beam with unbounded tendons is of rectangular section, 400mm wide with an effective depth of 800mm. The cross-sectional area of the pre-stressing steel is 2840 mm^2. The effective pre-stress in the steel after all losses is 900 N/mm^2. The effective span of the beam is 16m. f_{ck} = 40 N/mm^2, estimate the ultimate moment of resistance of section using IS : 1343 recommendations. **(14 Marks)**

6 a. Explain different methods of improving the shear resistance of PSC members. **(04 Marks)**

   b. The support section of a pre-stressed concrete beam 120 mm wide and 240mm deep is required to support an ultimate shear force of 75kN. The compressive pre-stress at the centroidal axis is 5 MPa, f_{ck} = 40 MPa, f_y = 415 MPa. Concrete cover to shear reinforcement is 50mm. Design a suitable shear reinforcement as per IS 1343 recommendations. **(16 Marks)**

7 a. What is transmission length? Explain factors influencing transmission length. **(06 Marks)**

   b. The end block of a post tensioned beam is 500mm × 1000mm. Two cables each comprising 55numbers of 7mm dia high tensile wires carrying a force of 2800 kN are anchored using a plate of side 305mm. The anchor plate centers are located symmetrically at 250mm from top and bottom edges of beam. Using Fe415grade yield bars, design suitable reinforcement in the end block using IS : 1343 code recommendations. **(14 Marks)**

8 a. Write briefly about the limiting zone for cables in PSC members. **(06 Marks)**

   b. A pre-tensioned PSC beam of rectangular cross-section is required to support a design ultimate moment of 120 kN-m. Design the section, take f_{ck} = 50 N/mm^2 and f_p = 1600 N/mm^2. **(14 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2017
Highway Geometric Design

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer any FIVE full questions, selecting
atleast TWO questions from each part.
2. Missing data, if any, may be suitably assumed.**

PART – A

1 a. Briefly explain the various factors which affect the road user characteristics. **(06 Marks)**
 b. List the various factors to be considered for the geometric design of highway. **(04 Marks)**
 c. Enumerate the concept of PCU in geometric design of highways and list out the various factors governing PCU. Give same typical value as recommended by IRC. **(10 Marks)**

2 a. Briefly discuss the pavement surface characteristics. **(10 Marks)**
 b. Explain how to decide the width of carriageway with neat sketch and mention IRC recommended values. **(06 Marks)**
 c. In a district where the rainfall is heavy, a major district road of WBM pavement 3.8m wide and a state highway of bituminous concrete pavement 7.0m wide are to be constructed. What should be the height of crown with respect to the edges in these two cases? **(04 Marks)**

3 a. What are the factors on which SSD depends? Explain the reaction time of driver using PIEV theory. **(06 Marks)**
 b. Derive an expression for calculating the overtaking sight distance (OSD) on a highway. **(07 Marks)**
 c. Two vehicles A and B are moving in the same direction with speeds of 100 kmph and breaking efficiency of 70% and 50% respectively. An object is seen by the both the drivers on the road approximately at a distance of 250m. Find : i) which vehicle will meet with an accident and ii) if the accident to be avoided, what is the breaking efficiency required? **(07 Marks)**

4 a. Derive necessary condition for centrifugal force ration to avoid overturning and skidding of vehicle. **(04 Marks)**
 b. What are the objects of providing extra-widening of pavements on horizontal curves. **(04 Marks)**
 c. A state highway passing through a rolling terrain has a horizontal curve of radius equal to the rolling minimum radius and length 200m on this highway :
 i) Design all the geometric features of this curve, assuming all data
 ii) Compute the set back distances required from the centre line on the inner side of the curve 60 as to provide for SSD 90m. Distance between the centerlines of the road --- inner lane is 1.9m. **(12 Marks)**

PART – B

5 a. Define gradient, explain in detail the different gradients adopted on a highway with specifications as per IRC. **(07 Marks)**
 b. Explain how the length of summit curve is designed. **(05 Marks)**
 c. A valley curve is formed by a desending grade of 1 in 25 meeting an ascending grade of 1 in 30m. Design the length of valley curve to fulfill both comfort condition and headlight sight requirements for a design speed of 80 kmph. C = 0.6,/sec. **(08 Marks)**

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6 a. With the help of heat sketches, indicate the various intersections at grade. State the advantages and disadvantages of grade separated intersections. **(10 Marks)**

b. What is an overpass and underpass? Mention the advantages and disadvantages of overpass and underpass. **(10 Marks)**

7 a. Explain with neat sketches different component of a rotary. What are the different shape adopted for rotary? **(10 Marks)**

b. Design the rotary inter section for the data given below, with suitable assumptions. The highways intersect at right angles and have a carriage way width of 15m. Also draw the diagram of the rotary designed.

Approach	Left turning								
	1	2	3	1	2	3	1	2	3
N	200	50	100	250	100	250	150	50	80
E	180	60	80	220	50	120	200	40	120
W	220	50	120	180	60	100	250	60	100
S	250	80	100	150	50	90	160	70	90

i) Passenger cars – 1 PCU

ii) Heavy commercial vehicles 2.8 PCU

iii) Scooter/motorcycles 0.75 PCU. **(10 Marks)**

8 a. Explain the significance of highway drainage. **(05 Marks)**

b. Discuss the steps involved in hydraulic analysis of highway surface drainage. **(07 Marks)**

c. The maximum quantity of water expected in one of the open longitudinal drains on clayey soil is $0.9m^3$/sec. Design the cross-section and longitudinal slope of trapezoidal drain assuming the bottom width of the section to be 1m and cross slope to be 1v to 1.5 H. The allowable velocity of flow in the drain is 1.2m.sec and mannings roughness coefficient is 0.02. **(08 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2017
Solid Waste Management

Time: 3 hrs.   Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting*
atleast TWO questions from each part.
2. Substantiate answer with neat sketches.
3. Missing data, if any, may be suitably assumed.

PART – A

1   a.   Define the terms : i) solid waste ii) solid waste management.   **(05 Marks)**
    b.   With a flow diagram, explain the material balance analysis method of waste quantification.   **(10 Marks)**
    c.   Estimate unit solid waste generation rate for a residential area having 1500 dwellinges with 6 persons per hours. The observation taken for a week at a disposal facility is as follows :

Vehicle	Number of loads	Average volume	density, kg/m³
Truck	10	10	350
Tractor	08	1.5	150
Private vehicle	22	0.3	100

                                                                                          (05 Marks)

2   a.   With the aid of schematic of HCS and SCS, explain the terms : pick up hond, at site and off route.   **(10 Marks)**
    b.   What is a transfer station'? Explain factors to be considered in the design of transfer station.   **(10 Marks)**

3   a.   Explain the factors to be considered in container   on site process technique.   **(10 Marks)**
    b.   What is meant by 'size reduction'? Enumerate the various equipments used and with a neat sketch, explain any one.   **(10 Marks)**

4   a.   What is pyrolysis? With a flow diagram, explain the process of pyrolysis.   **(10 Marks)**
    b.   Briefly discuss the various factors to be considered is design of an incinerating system.   **(10 Marks)**

PART – B

5   a.   With neat sketch, explain Indore and Bangalore method of composting.   **(10 Marks)**
    b.   Enumerate and briefly discuss the factors governing aerobic composting.   **(10 Marks)**

6   a.   What is a sanitary landfill? List and explain principal methods used for land-filling and explain is brief.   **(10 Marks)**
    b.   With neat sketches, briefly explain the various vent systems used to control the lateral movement of gases in landfill.   **(10 Marks)**

7   a.   Discuss the merits and demerits of hog feeding with solid waste.   **(06 Marks)**
    b.   Discuss the factors to be considered while disposing the solid waste into the ocean.   **(06 Marks)**
    c.   Briefly discuss the salient features of "The bio-medical waste (management and handling)Rules, 2000.   **(08 Marks)**

8   a.   What are the various opportunities available for reuse and recycling of solid waste?   **(08 Marks)**
    b.   Briefly explain the unit operations involved in processing recyclable materials.   **(06 Marks)**
    c.   Give the classification of plastics. Which type of plastics are recycled? Mention the uses of each type.   **(06 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2017

Air Pollution and Control

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer FIVE full questions, selecting*
at least TWO questions from each part.
2. *Missing data if any may be suitably assumed.*
3. *Draw neat sketches wherever necessary.*

PART – A

1 a. Define air pollution and briefly explain the various sources of air pollution. **(10 Marks)**
   b. Explain primary and secondary air pollutants with examples. **(10 Marks)**

2 a. List and explain effects of air pollutants on human and vegetation.
      i) Sulphur dioxide
      ii) Carbon monoxide **(10 Marks)**
   b. Explain briefly the case history of Bhopal gas tragedy. **(10 Marks)**

3 a. List the meterological factors influencing air pollution. **(04 Marks)**
   b. Explain the following:
      i) Inversion
      ii) Windrose **(08 Marks)**
   c. Explain different forms of plumes patterns under different stability conditions. **(08 Marks)**

4 a. Explain in brief factors to be considered in industrial plant location and planning. **(10 Marks)**
   b. What is noise pollution? What are the sources and effects of noise pollution? **(10 Marks)**

PART – B

5 a. With a neat sketch, explain typical sampling train for sampling gaseous pollutant. **(10 Marks)**
   b. With a neat sketch, explain the principle, construction and working of an electrostatic precipitator. **(10 Marks)**

6 a. Explain briefly air pollution due to automobiles. **(10 Marks)**
   b. Write short notes on effects and control of air pollution due to automobiles.

                                                       (10 Marks)

7 a. What is acid rain? How is it caused? Explain briefly the effect of acid rain on surface waters. **(08 Marks)**
   b. What is green house effect? Explain briefly effect of green house on environment. **(08 Marks)**
   c. Write brief note on indoor air pollution. **(04 Marks)**

8   Write brief note on:
   a. Environmental Acts
   b. Ambient air quality standards
   c. Ozone layer depletion
   d. Noise pollution standards **(20 Marks)**

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