| Hall Ticket Number : | | | | | | | | | | |
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**R-14**

**Code: 5G672**

IV B.Tech. I Semester Supplementary Examinations October 2020

# Design and Drawing of Steel Structures

( Civil Engineering )

Max. Marks: 70 Time: 3 Hours

## PART-A

**Answer *any one* questions** **1X28M=28M**

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1. Design a gantry girder to be used in an industrial building carrying a manually operated overhead travelling crane, for the following data

   Crane capacity=200KN

   Self weight of trolley, electric motor, hook=40

   Self weight of crane girder excluding trolley=200KN

   Minimum approach to crane hook to the girder=1.2m

   Wheel base=3.5m

   c/c distance between gantry rails=16m

   c/c distance between columns=8m

   self weight of rail section=300N/m

   diameter of crane wheels=150mm

   use steel of grade Fe410. No need of any checks. 28M

2. Design and detail a built up column with four angles .The column is 12m long and supported a factored axial compressive load of 700KN. The ends of the column are held in position and restrained against rotation. Design a suitable lacing system. Use steel of grade Fe410. 28M

## PART-B

**Answer *any three* questions** **3 X 14M=42M**

3. Discuss the advantages and disadvantages of welded connections over the bolted connections? And derive the formulae for finding horizontal, vertical and resultant of forces in case of eccentrically welded connections? 14M

4. A simply supported beam of span 10 in is carrying a uniformly distributed load of 30 kN/m. Design a beam using standard I-sections, if the compression flange of the beam is laterally supported throughout its length. 14M

3. A column am long has to support a factored load of 6000kN.the column is effectively held at both and restrained in direction at one of the ends. Design the column using beam section and plates. 14M

4. Design a single bolted double cover butt joint to connect boiler plates of thickness 16 mm for maximum efficiency. Use M 20 bolts of grade 4.6. Boiler plates are of Fe 410 grade. Draw the connection details. 14M

5. Design and detail a laterally unsupported beam of effective span 4mts carrying maximum bending moment and shear force as 550KNm and 200KN and assume a steel of grade fe410. 14M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G675**

IV B.Tech. I Semester Supplementry Examinations October 2020

# Prestressed Concrete

( Civil Engineering )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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## UNIT–I

1. a) Describe the historical developments in pre-stressed concrete. 7M

   b) Explain the Hoyer system with neat sketch. 7M

**OR**

2. a) Explain the characteristics of materials used for the preparation of pre-stressed concrete. 7M

   b) Enumerate the general principles of post-tensioning. 7M

## UNIT–II

3. Explain the following .

   (i) Loss due to elastic shortage of concrete. 7M

   (ii) Loss due to creep of concrete. 7M

**OR**

4. A pre-tensioned concrete beam,200mm wide and 4000mm deep, is prestressed by straight wires carrying an initial force of 280 kN at an eccentricity of 50mm. The modulus of elasticity of steel and concrete are 210 and 35kN/mm$^2$ respectively. Estimate the percentage loss of stress in steel due to elastic deformation of concrete if the area of steel wires is 188 mm$^2$. 14M

## UNIT–III

5. A concrete beam of rectangular section having a width of 300 mm and depth 600mm, is pre stressed by a cable carrying a force of 850 kN at an eccentricity of 100mm. If the beam supports a live load of 25 kN/m over a effective span of 7m, estimate the resultant stress at the top and bottom fibres at mid span section due to the effect of pre-stress, dead and live loads. Assume unit weight of concrete as 24 kN/m$^3$. 14M

**OR**

6. A rectangular concrete beam of cross section 300 mm deep and 200 mm wide is Pre-stressed by means of 20 wires of 5mm diameter located 6.5 cm from the bottom of the beam and 3 wires of diameter of 5 mm,2.5cm from the top. Assuming the pre-stress in the steel as 840 N/mm$^2$, calculate the stresses at the extreme fibres of the mid span section when the beam is supporting its own weight over a span of 7 m. If a uniformly distributed live load of 7 kN /m is imposed, evaluate the maximum working stress in concrete. The density of concrete is 24 kN/m$^3$ . 14M

**UNIT–IV**

7. The cross section of a bridge girder is made up of a T- section with the following details.

Top flange width and thickness = 650 mm and 250 mm.

Thickness of the web = 150mm.

Distance of the centroidal axis from the top of the section = 545 mm.

Area of cross section = 328500 $mm^2$

Moment of inertia = $665 \times 10^8$ $mm^4$.

The girder is used over an effective span of 30 m. The tendons with a cross section of 2300 $mm^2$ are parabolic with an eccentricity of 650mm at the centre of span and 285 mm at the support section. The effective pre stress in the tendons is 900 $N/mm^2$ after all losses. If the tensile strength of concrete is 1.6 $N/mm^2$, estimate the ultimate shear resistance of the support section, and the maximum possible uniformly distributed working load on the beam using an overall load factor of 2. 14M

**OR**

8. A pre tensioned concrete beam is pre stressed using 5mm diameter wires with an initial stress of 85 percent of the ultimate tensile strength of steel as1600 $N/mm^2$ .The cube strength of concrete at transfer is 30 $N/mm^2$. Calculate the transmission length and overall average bond stress. 14M

**UNIT–V**

9. The end block of a pre stressed beam 600mm wide and 1050 mm deep contains 6 Freyssinet cables, each carrying a force of 266 kN anchored through 100mm diameter anchorages, which are spaced 150mm apart at the end of the beam. Calculate the maximum tensile stress and the bursting tension and design the reinforcement for the end block using Rowes method. Adopt yield stress in mild steel reinforcement as 260$N/mm^2$. 14M

**OR**

10. A high tensile cable comprising 12 strands of 15 mm diameter with an effective force of 2500 kN is anchored concentrically in an end block of a post tensioned beam. The end block is 400 mm wide by 800 mm deep and the anchor plate is 200 mm wide by 260 mm deep. Design suitable anchorage zone reinforcements using Fe 415 grade HYSD bars using IS : 1343 code provisions. 14M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G673**

IV B.Tech. I Semester Supplementary Examinations October 2020

# Bridge Engineering

( Civil Engineering )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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## UNIT–I

1. Explain briefly the importance of site investigation for bridges? 14M

**OR**

2. Design a reinforced concrete box culvert having a clear vent way of 4m by 4m.The super imposed dead load on the box culvert is 15kN/m$^2$.The live load on culvert is 50kN/m$^2$.Unit weight of soil t site is 18kN/m$^3$.Angle of repose is=30°.Adopt M20 grade concrete and Fe 415 steel .Sketch the details of reinforcement in the box culvert 14M

## UNIT–II

3. Design a reinforced concrete slab culvert for a national highway crossing to suit the following data

Carriage way =Two lane
Foot path = 1m on either side
Clear span = 6.3m
Wearing coat =80mm
Width of Bearing =400mm,
Materials: M25 Grade concrete and Fe 415 steel
Loading – IRC class AA tracked vehicle.

Design a reinforced concrete slab deck and sketch the details of reinforcements in the longitudinal and cross sections 14M

**OR**

4. Design a Interior panel of slab of a T beam bridge for a national highway crossing to suit the following data

Carriage way =Two lane
Effective span =16m
Wearing coat =80mm
Materials: M25 Grade concrete and Fe 415 steel
Loading – IRC class AA tracked vehicle .Assume any other data. 14M

## UNIT–III

5. Describe briefly about elements of a plate girder bridge? 14M

**OR**

6. Explain the design procedure of composite bridges? 14M

## UNIT–IV

7. Explain the working principle of a steel roller cum rocker bearing. Also sketch the arrangement of the bearing neatly. 14M

**OR**

8. Design a steel rocker bearing for transmitting a vertical reaction of 1000 kN and a horizontal reaction of 100 kN at the support of a bridge girder, assuming the following permissible stresses according to IRC:83-1982.. Permissible compressive stress in concrete bed block = 4 N/mm$^2$, permissible bending stress in steel plate = 160 N/mm$^2$, permissible bearing stress in steel plate =185 N/mm$^2$, permissible shear stress in steel = 105 N/mm$^2$. Sketch the details of the rocker bearing. 14M

## UNIT–V

9. Explain various types of wing walls with neat sketches. 14M

**OR**

10. Verify the stability of the abutment of a bridge with the following details. Top width 1.5m, height 4m, back butter : 1 in 6, front face of the abutment is vertical, material : stone masonry, unit weight of soil : 18 kN/m$^3$ , angle of repose ; 30 degrees, super structure : T-beam bridge of span 15m, Loading : IRC class AA, assume suitable dimensions for the components of the super structure. 14M

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