Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019
Course Code: CE463
Course Name: BRIDGE ENGINEERING

Max. Marks: 100   Duration: 3 Hours
(Use of IS 456, SP 16, IRC 5,IRC 6,IRC 78,IRC 83,IRC 112 and Pigeaud's curves may be permitted)
PART A
Answer any two full questions, each carries 15 marks.   Marks

1 a) Explain, with a neat sketch, the various components of a bridge.   (5)

   b) A bridge is to be constructed over a river that forms a part of National Highway.   (10)
       Explain the process of soil investigation to be conducted on the area for the bridge
       construction.

2 a) Write note on the classification of bridges?   (8)

   b) What are impact factors? In what way these factors vary with respect to the type   (7)
       of loading, span and types of bridges.

3 a) List the characteristics of an ideal site for bridge construction   (7)

   b) Write note on standard specifications recommended by IRC codes for Road   (8)
       bridges on: (i) Longitudinal forces (ii) Centrifugal forces (iii) Buoyancy effect
       (iv) Earth pressure

PART B
Answer any two full questions, each carries 15 marks.

4 a) What are the critical loading conditions to be considered in evaluating the   (4)
       maximum design moments and forces in a box culvert?

   b) Explain the typical structural elements of a reinforced concrete Tee beam and slab   (5)
       bridge deck and their functions.

   c) Explain Courbon's method for proportioning the live load bending moments in   (6)
       bridges.

5 a) Design a RC slab culvert for a NH crossing to suit the following data: (15)
       Carriageway – Two lane
       Footpaths – 1m on either side
       Clear span – 6m
       Width of bearing – 400 mm

Materials – M25 grade concrete and Fe 415 steel

Loading – IRC Class AA tracked vehicle, Serviceability checks are not required.

6 a) Design a cantilever slab of a Tee beam and Slab bridge deck using the following   (15)

data:

Width of roadway – 7.5m

Width of kerb – 600mm

Depth of kerb – 300mm

Number of longitudinal girders – 3

Width of girder – 300mm

Spacing of longitudinal girder – 2.5m

Thickness of wearing coat – 80mm

Materials – M25 grade concrete and Fe 415 steel

Loading – IRC Class A wheel load

PART C
Answer any two full questions, each carries 20 marks.

7 a) Determine the minimum section modulus , prestressing force and eccentricity of a   (20)

prestressed concrete slab bridge having the following data:

Carriageway width -2 lane

Clear span -10 m

Width of bearing - 400 mm

Footpath on either side -1 m

Ultimate tensile strength of steel -1500 N/mm^2.

Compressive stress of concrete at transfer, f_{ci} =35 N/mm^2

f_{ct}=15 N/mm^2,f_{cw}=12 N/mm^2,f_{tt}=f_{tw}=0

Loss ratio=0.8

Materials- M40 concrete

Live load-IRC Class AA tracked vehicle.

8 a) Design an elastomeric pad bearing for a two lane reinforced concrete T-beam   (20)

bridge for 15 m effective span having the following data:

Maximum dead load reaction per bearing- 280 kN

Maximum live load reaction per bearing - 520 kN

Vertical reaction induced by longitudinal force per bearing - 12 kN

Longitudinal force per bearing – 30 kN

Modulus of rigidity-1 N/mm^2

Rotation of bearing due to dead load and live load – 0.0025 rad

M 20 grade concrete.

9   a)   What are the advantages of Prestressed concrete bridges over RCC bridges?   (5)

      b)   Explain the functions of bridge bearings.   (5)

      c)   With neat sketch, explain well foundation and its components. Sketch the   (10) reinforcement details of well foundations.

<div align="center">****</div>