

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

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|---|---|------|
| 1 | a) Explain, with a neat sketch, the various components of a bridge. (5) | (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. | (10) |
| 2 | a) Write note on the classification of bridges? (8) | (8) |
| | b) What are impact factors? In what way these factors vary with respect to the type of loading, span and types of bridges. (7) | (7) |
| 3 | a) List the characteristics of an ideal site for bridge construction (7) | (7) |
| | b) Write note on standard specifications recommended by IRC codes for Road bridges on: (i) Longitudinal forces (ii) Centrifugal forces (iii) Buoyancy effect (iv) Earth pressure (8) | (8) |

PART B

Answer any two full questions, each carries 15 marks.

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|---|---|------|
| 4 | a) What are the critical loading conditions to be considered in evaluating the maximum design moments and forces in a box culvert? (4) | (4) |
| | b) Explain the typical structural elements of a reinforced concrete Tee beam and slab bridge deck and their functions. (5) | (5) |
| | c) Explain Courbon's method for proportioning the live load bending moments in bridges. (6) | (6) |
| 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 | (15) |

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/mm².

Compressive stress of concrete at transfer, $f_{ci}=35$ N/mm²

$f_{ct}=15$ N/mm², $f_{cw}=12$ N/mm², $f_{tt}=f_{tw}=0$

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/mm²

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 reinforcement details of well foundations. (10)
