

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Examination (Regular and Supplementary), December 2020

Course Code: CE463**Course Name: BRIDGE ENGINEERING**

Max. Marks: 100

Duration: 3 Hours

*(Use of IS 456, SP 16, IRC 5, 6, 18, 21, 78, 83, 112 and Pigeaud's curves may be permitted)***PART A***Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) Describe the classification of bridges based on the structural forms of the superstructure. (7)
- b) How to ascertain the suitability of a site for constructing a bridge? (8)
- 2 a) Define impact factor. 'Impact factor is less for bridges of large span'. Justify the statement. (5)
- b) Explain the action of following loads on bridges: (10)
- (i) Longitudinal forces (ii) Buoyancy effects
- 3 a) Draw neat sketches of the longitudinal and transverse views of a typical road bridge and mark the components. (7)
- b) Which is the extra load to be considered in the design when the bridge is curved? Explain with IRC specifications. (8)

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

- 4 Design the interior slab panel of a T-beam and slab bridge with the following data: (15)
- Effective span: 14 m
- Carriageway width: 7.5m
- Kerb: 600mm width on either side
- Provide three longitudinal girders and five cross girders.
- Loading: IRC Class A vehicle
- Adopt M30 concrete and Fe 415 grade steel.
- Shear checks are not required. Sketch the reinforcement details.
- 5 a) What is a box culvert? Explain its loading conditions and the critical load combinations for the design. (8)

- b) Explain the 'effective width method' for estimating the bending moment in one-way slab bridges under patch loads. (7)
- 6 Design the outer longitudinal girder of a T-beam and slab bridge having the following data: (15)
- Effective span: 16 m
- Carriageway width: 7.5m
- Kerb: 600mm width on either side
- Loading = IRC Class A vehicle
- Adopt M25 concrete and Fe 415 grade steel. Checks are not required.
- Sketch the reinforcement details.

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Explain the roles of bearings in bridges? List the factors to be considered for the selection of bearings. (6)
- b) Write a short note on 'well foundation' with a neat sketch. (8)
- c) Discuss the advantages of elastomeric bearings. (6)
- 8 a) What are the advantages and types of pre-stressed concrete bridges? (8)
- b) List the various forces acting on a typical bridge pier. (4)
- c) Explain the step-by-step procedure for the design of an abutment. (8)
- 9 The various forces acting on a highway bridge pier are listed below. (20)
- Dead loads from each span = 2400 kN,
- Reaction due to live load on one span = 1000 kN,
- Wind pressure on pier = 2.4 kN/m^2 , Breaking force = 120 kN,
- Dimensions of pier: Height of pier = 10 m,
- Width at top = 2 m, Width at bottom = 3 m, Length of pier = 9 m,
- Maximum water level = 8 m above the base of pier,
- Girder bearings are located at 500 mm from the centre of the pier on either side.
- Check the adequacy of the pier dimensions provided by computing the stresses developed at the base due to various loads.
