

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), Nov.-Dec.2015

B. Tech in Civil Engineering, Semester VII

Roll No.....

COURSE CODE: CE731 Design of Bridge Structure

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
 2. Assume suitable data wherever required and mention it clearly.
 3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
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Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10

- i. Pigeaud's method is used in bridges to compute bending moments for (a) interior panel (b) longitudinal girder (c) cantilever slab (d) none of the above
- ii. The loads accounted for design of substructure are (a) wind load (b) buoyancy (c) friction (d) all of the above
- iii. The bearings (a) are mechanical devices (b) they transfer loads from substructure to superstructure (c) they do not permit rotation (d) none of the above
- iv. IRC 83 (Part II) is related to (a) live loads for bridges (b) elastomeric bearings (c) both a and b (d) none of the above
- v. The most suited bridge type for better view of surroundings is (a) Deck bridge (b) Arch bridge (c) Truss bridge (d) Rigid frame bridge
- vi. The live loads prescribed by IRC 6 include (a) Class A (b) Class 70 R (c) Class AA (d) all of the above
- vii. The minimum clearance between road face of the kerb and the outer edge of the wheel or track 'C' as per IRC:6-2014 for Class A wheeled load is:
(a) 0.15 m (b) 1.20 m (c) between 0.40 m to 1.20 m (d) more than 1.20 m
- viii. For carriageway width 5.3 m and above but less than 9.6 m the load combination is: (a) one lane of Class 70R or two lanes of Class A (b) Two lanes of Class A (c) Three lanes of Class A or Two lanes of Class 70R (d) none of the above
- ix. For Class A wheeled load the value of impact factor fraction as per IRC:6 for span 4.0 m of reinforced concrete bridge is:
(a) 0.45 (b) 0.9 (c) 0.225 (d) 0.6
- x. The substructure is the part of the bridge which is level of bearing.
(a) below (b) above (c) at (d) none of the above.

Q.2 Short answer type questions (4 questions @ 2.5 marks) 10

- (A) Write short note on bridge bearings.
- (B) Explain the different types of bridge maintenance.
- (C) What is the purpose of providing expansion joints in bridges? Discuss in detail.
- (D) What are different types of foundations used for bridges? Discuss with neat

sketches.

- Q.3A Explain Courbon's theory of determining the load carried by longitudinal girder of a T-beam bridge. 05
- Q.3B Classify the bridges on the basis of materials of construction and forms of superstructure. 05
- Q.4A How choice of particular bridge type is decided? Discuss using suitable examples. 05
- Q.4B What are various live loads and their combinations considered for design of bridges? Discuss in detail with neat sketches. 05
- Q.5A Write short note on Pigeaud's method of evaluating bending moments for bridge panels. 05
- Q.5B What are the various factors to be considered in the selection of a suitable bridge site? 05
- Q.6A Design and sketch reinforcement details of kerb beam of a deck slab bridge using the following data: 05
- (a) Kerb width= 0.60 m
 - (b) Minimum height of kerb above road level =0.225 m
 - (c) Live load acting on bridge = 72.94 kN-m
 - (d) Grade of concrete and reinforcement: M25 & Fe415
- Q.6B Enumerate and discuss the various loads prescribed by IRC for design of bridge substructure. 05
- OR
- Q.6B Using assumed data, discuss the design of a bridge pier. 05
- Q.7A Discuss cantilever method for bridge deck construction. 05
- Q.7B What types of maps, plans and sections collected before planning of bridge? 05
- OR
- Q.7B Using neat sketch explain the various components of a bridge. 05
- Q.8A Design an elastomeric pad bearing using the following data: 10
- (a) Maximum dead load reaction per bearing= 300 kN
 - (b) Maximum live load reaction per bearing= 700 kN
 - (c) Longitudinal force due to friction per bearing= 45 kN
 - (d) Effective span of the girder= 16.0 m
 - (e) Estimated rotation at bearing =0.002 radians.
 - (f) Concrete grade M-20
- Shear strain due to creep, shrinkage and temperature= 6×10^{-4} .
- Q.9A Design a deck slab bridge for IRC class A loading for the following data: 10
- (i) Clear Span= 5.5 m
 - (ii) Clear width of roadway= 6.8 m
 - (iii) Average thickness of wearing coat = 7.5 mm

- (iv) Kerb width on each side = 600 mm
- (v) Grade of concrete and steel = M25 & Fe415

Q.10 Design the cantilever slab of a T-beam and slab bridge using the following data: 10

- (a) Width of roadway = 7.5 m
- (b) Width of kerb = 600 mm
- (c) Depth of kerb = 300 mm
- (d) Nos. of longitudinal girder = 3
- (e) Width of girder = 300 mm
- (f) Thickness of slab (average) = 300 mm
- (g) Spacing of longitudinal girders = 2.5 m
- (h) Loading: IRC Class A
- (i) M-20 grade of concrete, Fe415 HYSD bars

Assume missing data if any.