Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**Supplementary Examination – June – 2017**

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| **Code :** | **14CE3010** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ADVANCED BRIDGE ENGINEERING** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| Q. No. | Sub Div. | Questions | Course  Outcome | Marks |
| 1. | a. | Can you distinguish 70R loading with Class AA loading. | CO1 | 5 |
| b. | A reinforced concrete simply supported slab is required for the deck of a road bridge having the data given below:  Width of carriageway - 7.5m  Kerbs - 600mm wide  Clear span - 5m  Type of loading - IRC Class AA tracked vehicle  Materials – M20 grade concrete, Fe415 grade tor steel  Design the deck slab and sketch the details of reinforcements in the longitudinal and cross-sections of the slab. | CO2 | 15 |
| (OR) | | | | |
| 2. | a. | Explain how Pigeauds design curves are used in the design of deck slabs. | CO1 | 5 |
| b. | An RCC Tee beam and slab deck is to be designed for a major river crossing in a National Highway. The following data is available  Clear width of roadway - 7.5m  Footpaths - 1.5m on either side  Wearing coat - 100mm  No. of main girders - 4  Span (C/c of bearing) - 20m  Spacing of cross girder - 5m c/c  Loading - IRC Class AA tracked vehicle  M20 grade of concrete and Fe 415 grade steel is used  Design the deck slab only. | CO2 | 15 |
| 3. | a. | Can you suggest why simply supported girder bridges can be preferred against the use of continuous girder bridges. | CO3 | 5 |
|  | b. | Design a suitable section for the longitudinal girder of a post tensioned prestressed concrete T Beam Bridge for a National Highway crossing to suit the following data:  Effective span - 16m  Equivalent Live load - 20kN/m    Adopt M45 grade of concrete with cube strength at transfer as 40 N/mm2. Loss ratio – 0.85 and the 7mm HTS wires initially stretched to 1200MPa.need to be used. | CO2 | 15 |
| (OR) | | | | |
| 4. | a. | Specify when Prestressed concrete bridges are preferred? | CO1 | 5 |
|  | b. | Design a post- tensioned prestressed concrete slab bridge for a national highway crossing to suit the following data:  Width of carriage way = 7.5m  Foot path = 1m on either side  Kerbs = 600mm wide  Clear Span = 8 m  Type of loading = IRC Class AA or Class A whichever gives  the worst effect  Materials – M40 grade concrete and 7mm diameter high tensile wires with an ultimate tensile strength of 1500 N/mm2 housed in cables with 12 wires and anchored by Freyssinet anchorages of 150mm diameter. Compressive strength at transfer, fci = 35 N/mm2. Loss ratio = 0.8. Design the deck slab | CO2 | 15 |
| 5. | a. | Can you list the roles of stringers in highway bridges. | CO1 | 5 |
|  | b. | The effective span of a through type plate girder two lane highway bridge is 30m. The reinforced concrete slab is 250mm thick inclusive of the wearing coat. The footpaths are provided on both the sides of the carriageway. The cross girders are provided at 3m c/c. The stringers are spaced at 2.45m c/c. The spacing between main girders is 9.8m. Design the maximum section of the plate girder, if the bridge is to carry IRC class A standard load. | CO2 | 15 |
| (OR) | | | | |
| 6. | a. | Can you envisage why cross frames are provided in deck type plate girder bridges. | CO1 | 5 |
|  | b. | A Pratt truss girder through bridge is provided for single broad gauge track. The effective span of bridge is 40m. The cross girders are spaced at 5m apart. The stringers are spaced 2m between centerlines. 0.60kN per meter stock rails and 0.40kN per metre checkrails are provided. Sleepers are spaced at 0.45m from center to center and are of size 2.8 m x 250 mm 250 mm. The weight of timber may be assumed as 7.5kN/m3. The main girders are provided at a spacing of 7m between their centerlines. Find the forces in the central panel members. | CO2 | 15 |
| 7. | a. | Can you recognize the forces acting on a bearing? | CO1 | 5 |
|  | b. | What way would you list the loads acting on a pier for a safer design? | CO3 | 5 |
|  | c. | Verify the stability of the abutment shown in Fig.1.  The other salient details are given below:   * 1. Materials of the abutment – concrete   2. Density of the soil - 18 KN/m3   3. Coefficient of friction - 0.5   4. Angle of repose of the soil - ϕ = 30°   Live load on the bridge: IRC Class AA (tracked)  Span of the bridge = 12m  Angle of friction between the soil and concrete = δ = 18°  The bridge deck consists of three longitudinal girders 1.5m depth with a deck slab of 200mm thick. | CO2 | 10 |
| (OR) | | | | |
| 8. | a. | Comment on the basic functions of an abutment. | CO1 | 5 |
|  | b. | Can you list the different types of bearings? | CO1 | 5 |
|  | c. | How would you verify the adequacy if the dimensions for a pier which seemed to undergo failure? | CO3 | 10 |
|  | | **Compulsory:** |  |  |
| 9. | a. | How would you prioritize the precautions to be taken during bridge maintenance? | CO3 | 5 |
|  | b. | List the equipment needed for bridge inspection. | CO1 | 5 |
|  | c. | Enumerate maintenance works for a major bridge. | CO3 | 10 |

ALL THE BEST