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

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**End Semester Examination – Nov/Dec – 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. | How would you distinguish Class A and Class B loading? | CO1 | 5 |
| b. | A reinforced concrete simply supported slab is to be designed for a road bridge having the data given below:  Width of carriageway - 7.5m  Kerbs - 600mm wide  Clear span - 6m  Type of loading - IRC Class AA tracked vehicle  Materials – M20 grade concrete, Fe415 grade tor steel  Design the deck slab. | CO2 | 15 |
| (OR) | | | | |
| 2. | a. | Can you name the methods of analysing the longitudinal girder of a RCC bridge. Also list all the conditions for adopting the method which is being practiced in the field. | 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. | 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 - 15m  Equivalent Live load - 18kN/m  Adopt M45 grade of concrete with cube strength at transfer as 40 N/mm2. Loss ratio – 0.80 and the 7mm HTS wires initially stretched to 1200MPa.need to be used. | CO2 | 15 |
| (OR) | | | | |
| 4. | a. | Specify the reasons for preferring Prestressed concrete bridges. | 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 cross girders and stringers in railway steel bridges. | CO1 | 5 |
|  | b. | Bring out the design procedure of a steel plate girder railway bridge. | 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 pier? | CO1 | 5 |
|  | b. | 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 | 15 |
| (OR) | | | | |
| 8. | a. | Comment on the basic functions of a pier. | 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. | Enumerate the failure of a major bridge. | CO3 | 15 |

ALL THE BEST