

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – II • EXAMINATION – WINTER • 2014****Subject code: 1721504****Date: 04-12-2014****Subject Name: Analysis and Design of Bridges****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

1. **Attempt all questions.**
 2. **Make suitable assumptions in the absence of data and mentioned it clearly in the starting of the question.**
 3. **Draw figures as and when found necessary in support of the calculations.**
 4. **Use of IRC-5, 6, 21 codes are permitted**
 5. **Take M25 grade of concrete & Fe500 grade of steel, is not specified.**
- Q.1** A simply supported 2 lane bridge with footpath on both sides having centre to centre span of 25 m is required to be constructed as a T beam type superstructure. Propose a structural system suitable for the same supported by drawings of its plan, longitudinal section & cross sections indicating appropriate dimensions. Provide enough length of end widening to account shear. **14**
- Q.2** (a) Calculate total bending moment at center of span due to DL and SIDL for the bridge section assumed in Q.1. **07**
- (b) Determine distribution factor for bending moment in each girder for the section assumed in Q.1 due to class 70R wheeled vehicle, using Courban's method. **07**
- OR**
- (b) Calculate total bending moment at center of span due to Class 70R wheeled load and class AA tracked load for section assumed in Q.1. **07**
- Q.3** (a) Calculate total shear force at quarter span due to DL and SIDL for the bridge section assumed in Q.1. **07**
- (b) Calculate total bending moment at center of span due to Class 70R wheeled load and class AA tracked load for the bridge section assumed in Q.1. **07**
- OR**
- (b) Calculate bending moment in both directions of a two way slab having dimensions 2.5 x 2.0m continuous on all four sides for Class AA track load. **14**
- Q.4** Draw the sketch of intermediate substructure supporting two span ROB of 2 lane on either sides and each has 25 m c/c distance. Assume structural section same as of Q.1. The top of pier cap is kept at 7.5 m. above ground level. The foundation is open type and is kept 2.5 m below ground level. Indicate all components with tentative dimensions. Just enlist the forces which are likely to act on sub-structure. Write the steps to check the stability of pier at base of footing considering all possible forces acting on it. **14**
- OR**
- Q.4** Draw the sketch of abutment substructure supporting 2 lane bridge span having span length 25 m. Assume structural section same as of Q.1. The top of pier cap is kept at 7.5 m. above ground level. The foundation is open type and is kept 2.5 m below ground level. Indicate all components with tentative dimensions. Just enlist the forces which are likely to act on sub-structure. Write steps to check the stability of pier at base of footing considering all possible forces acting on it. **14**
- Q.5** A central pier substructure supports bridge span of 2 lanes with 25 m c/c distance on either side. Assume structural section same as of Q.1. The top of pier cap is kept at 10.5 m. above general ground level. The HFL is at 7m above GL, SRL is 10m below GL and FRL is 25m below GL. The foundation can either be pile foundation or it can be well foundation. Assume any one and draw the sketch of substructure indicating all components with tentative dimensions. Enlist the forces which are likely to act on sub-structure. **14**

OR

- Q.5** Explain IRC provisions in brief for the items given below
- a. Vehicular load for 3 Lane national highway bridge
 - b. Effect of impact of vehicles
 - c. Breaking force due to vehicle
 - d. Water current forces on substructure
 - e. Effect of live load on earth pressure at abutment walls
 - f. Vertical clearances under the bridge
 - g. Vehicle collision load on bridges & flyover supports

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