

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014****Subject code: 1721504****Date: 20-06-2014****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 mention 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 and Fe500 grade of steel, is not specified.

- Q.1 (a)** Give IRC provisions for following items: **10**
- a. Combination of live load to be considered in design
 - b. Recommendations for ductile detailing
 - c. Determination of water current force

- (b)** Calculate footpath live load for a bridge having effective span of 35 m and width of footpath of 1.5 m. **04**

- Q.2 (a)** Give different methods for distribution of total moment and shear force in different girders for a T beam type bridge and discuss any one of them in detail. **07**

- (b)** Give the criteria for consideration of impact factor for the live load for RCC bridges and determine the impact factor for live load of class AA wheeled vehicle for RCC bridge having span of 20 m. **07**

OR

- (b)** Determine the longitudinal force due to braking at left support for a simply supported span of 20 m having fixed bearing at left support and free bearing at right support. The horizontal force in longitudinal direction on the span is 300 kN and reaction due to DL and LL at left support is 375 kN and 615 kN respectively. Take coefficient of friction is 0.05. **07**

- Q.3** A T beam type superstructure with 3 longitudinal girders is proposed for a simply supported 2 lane bridge with footpath on one side and safety curb on other side for a c/c span of 20 m. The girders are provided with a spacing of 2.75 m c/c. Draw cross section of superstructure showing dimension of all components clearly. Determine the maximum bending moment in the external girder due to class 70R wheeled vehicle only. **14**

OR

- Q.3** Design a slab of a bridge given in Q.2. The cross girders are provided at 5 m c/c. Consider DL, SIDL and LL of class A wheeled vehicle only. Draw detailing of reinforcements also. **14**

- Q.4** Check the stability of mass concrete pier at its base of a two span simply supported ROB of 6.0m c/c span each. The superstructure is slab type having total width of 5.5m. A wall type pier is having a cross section 0.85m x 5.5m at top and 1.2m x 5.85m at bottom. The height of pier is 8 m. Assume dead load reaction from each side of superstructure is 185 kN. Consider class A wheeled vehicle load only. Neglect earthquake and wind loads. **14**

OR

- Q.4 (a)** Briefly mention the procedure to determine the seismic force on the bridges. **07**

- (b) Determine water current force on wall type pier of a 1.2m x 6m size with a semicircular ends. The RL of different points are given below: 07
Top of pier $\ddot{}$ 101.5 m, HFL $\ddot{}$ 100.5 m, Ground level $\ddot{}$ 94.5 m and scour level $\ddot{}$ 92.5 m, foundation level $\ddot{}$ 90.0 m.
Take velocity of water in the upstream is 2.48 m/sec. Determine moment due to water current force at the foundation level.
- Q.5 Design and detail open foundation for a wall type pier for following data: 14
Cross section 1.2m x 3.5m, Axial load = 1500 kN, Longitudinal moment = 450 kN.m, transverse moment = 75 kN. Consider 3 m as depth of foundation is 3.0 m.

OR

- Q.5 (a) Draw free sketch of well foundations showing all necessary components and give IRC provisions for its design. 04
- (b) A circular pier of 2.0 m diameter is supported on a pile foundation of 6 nos $\ddot{}$ 600 mm diameter. The piles are arranged in two rows with a c/c distance of 2.5 m and length of 15 m from ground level. The pile cap is having a size of 3.7m x 6.2m and 1.5m depth. The pier is subjected to axial load = 1500 kN, Longitudinal moment = 450 kN.m, transverse moment = 75 kN.m. Estimate load on each pile and design and detail neatly. Take M25 grade of concrete and Fe500 grade of steel. 10
