Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
ME – SEMESTER IV (NEW) – • EXAMINATION – SUMMER 2016

Subject Code: 2742002   **Date:04/05/2016**
Subject Name: Design of Bridges
Time:10:30 am to 01:00 pm   **Total Marks: 70**
Instructions:
    1. **Attempt all questions.**
    2. **Make suitable assumptions wherever necessary.**
    3. Figures to the right indicate full marks.
    4. **IRC 5, 6, 78 and Pigeaud's curve are permitted.**
    5. **Adopt M30 grade of concrete and Fe500 grade of steel, until otherwise specified.**
    6. **Draw neat and clean figures with pencils only.**

Q.1	**(a)**	Prove that cost of bridge will be minimum when the spans are so arranged that the cost of one pier is equal to the cost of the girder of one span.	**07**
	(b)	Explain the need of impact factors with necessary codal provisions.	**07**
Q.2	**(a)**	Explain the Hendry Jaeger Method with its limitations.	**07**
	(b)	Explain the procedure to determine the seismic force on the bridges	**07**

<div align="center">OR</div>

	(b)	Elaborate the criteria for the selection of type of bridge at the specific site.	**07**
Q.3		Design the intermediate girder only of RCC T beam and deck slab bridge for the following data: Effective span of girders: 20 m Clear width of road way : 7.5 m Spacing of cross girder and main girder: 4 m and 2.5 m c/c Number of main girder: 4 Thickness of deck slab and wearing coat: 250 mm and 80 mm Type of loading: IRC 70-R ó Tracked Vehicle Kerb size: 650 x 280 mm Use 32 mm diameter bar for main reinforcement and 10 mm diameter bar for stirrups. Use impact factor as per IRC, also use Courbon's method for the distribution of live load. Draw typical sketch also with reinforcement detail in girder.	**14**

<div align="center">OR</div>

Q.3	**(a)**	State and explain the design steps of pier and pier cap.	**07**
	(b)	Draw different types of substructure option and designate each element of all substructure options.	**07**
Q.4		Design the deck slab only for RCC bridge the following data: Effective span of girders: 16 m Clear width of road way : 7.5 m Spacing of cross girder and main girder: 4 m and 2.5 m c/c Type of loading: IRC AA ó Tracked Vehicle Use impact factor as per IRC. Draw typical sketch also with reinforcement detail in girder.	**14**

<div align="center">OR</div>

Q.4		Design and detail open foundation for a wall type pier for following data. Cross section 1.5 m x 3.8 m, Axial load = 1800 kN, Longitudinal moment = 400 kN.m, Transverse moment = 75 kN. Consider 3 m as depth of foundation is 3.2 m.	**14**

Q.5 Design a post tensioned prestressed girder only for bridge for the following data: Effective span = 20 m, width of road = 7.5 m, Kerb = 600 mm on both sides, concrete grade = 50 Mpa for girder. Cube strength at transfer = 35 MPa, loss ratio = 0.85, M-40 grade concrete and High strength wires of 1500 MPa strength, Fe-415 for other reinforcement. **14**

OR

Q.5 **(a)** Elaborate the design steps of balanced cantilever bridge. **07**

(b) State and explain the guidelines to control cracking as per IRC. **07**

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