Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER IV (NEW) – • EXAMINATION – WINTER 2016

Subject Code: 2742002 **Date: 26/10/2016**

Subject Name: Design of Bridges

Time:02:30 pm to 05:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q 1 Design a post tensioned prestressed concrete Slab bridge deck for following data. [14]
(1). Clear span = 14 m
(2). Width of bearing = 400mm
(3). Clear width of road way = 7.5m
(4). Footpath of 1 m on either side, kerbs of 500 mm size
(5). Wearing coat = 90 mm thick
(6). Live Load: IRC- Class AA Tracked Vehicle
(7). M-35 grade concrete and High strength wires of 1500 MPa strength
(8) Fe-415 for other reinforcement
(9) Loss ratio = 0.8, Compressive strength at transfer = 35 MPa

Q.2 (a) Explain IRC provisions in brief for the items given below [07]
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

Q.2 (b) Draw free sketch of well foundations showing all necessary components and give IRC provisions for its design. [07]

OR

Q.2 (b) Elaborate design steps of well foundation. [07]

Q 3 A 10 m high pier with semi circular ends has following data (Figure 1): [14]
Top Width: 2m
Bottom width: 3m
HFL= 9m
Dead load from each span: 2400 kN
Reaction due to Live load:1200 kN acting at eccentricity 0.5m
Braking forces: 140 kN
Wind pressure on pier: 2.4 kN/m^2
Material of pier: 1:3:6 cement concrete
Density of concrete: 25 kN/m^3
Calculate the stress developed at the base of the pier due to following cases

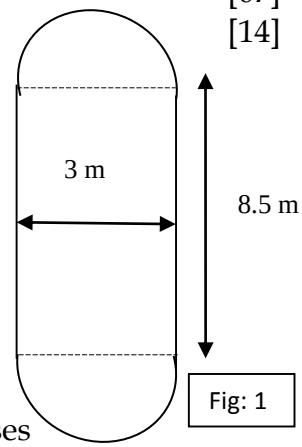

Fig: 1

1. Dead Load and Self weight
2. Effect of buoyancy
3. Due to eccentricity of live load
4. Due to longitudinal braking forces
5. Due to wind pressure

Estimate the maximum and minimum stresses developed at the base of the pier due to critical combinations of the various loads.

OR

Q 3 (a) Draw a free hand sketch of a suitable section of substructure at pier having top of pile cap at 6.5m, HFL 2m and founding level 25m below bearing level. Assume pile foundation with two piles of 1.2m diameter in two rows for substructure [07]

Q 3 (b) Elaborate the design steps of pier and pier cap. [07]

Q 4 Design an RCC T-beam girder bridge for following details. [14]
(1). Clear Width of road way = 7.5 m
(2). Span of bridge = 14 m
(3). Live Load = IRC - Class AA Tracked Vehicle
(4). Thickness of wearing coat = 100 mm
(5). Use M-30, Fe-415
Design deck slab and main girder. Draw typical sketches

OR

Q 4 Calculate the values of maximum shear force, longitudinal and transverse bending moments for Live Loads as per IRC6:2014 for a bridge of span 20 m.Consider Class 70R, Class A and Class AA for both wheeled load and tracked load. [14]

Q 5 (a) Explain the criteria for selection of type of bridge. [07]

Q 5 (b) Write short note on Pigeaud's Curves and their uses. [07]

OR

Q 5 Design a well foundation for abutment of 12 m x 6 m base dimension. Well is on clayey soil. Height of bearing above maximum scour level = 32m. Height of abutment= 8m.Permissible horizontal displacement at bearing level = 50mm.Total vertical load(weight of abutment and well) = 30,000 kN. Total lateral load at scour level=500kN.Take submerged unit weight of soil as 9.5 kN/m^3.Perform all checks. [14]