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M.Tech Structural Design (Sem.-1) DESIGN OF BRIDGES Subject Code : MTSD-105 M.Code : 74246 Date of Examination : 23-01-2023

Time: 3 Hrs.

Max. Marks : 100

INSTRUCTION TO CANDIDATES :

- 1. Attempt any FIVE questions out of EIGHT questions.
- 2. Each question carries TWENTY marks.
- 3. Missing data may be suitably assumed.
- 1. What factors are taken into consideration for deciding the location of a bridge? Give the data needed for the design of the bridge.
- 2. A RCC "T" beam and slab girder deck is required for the crossing of national highway for the following data.

Clear width of roadway : 25m

Effective span : 30m

Live Load class AA

Thickness of wearing coat : 100mm

Spacing of cross girders : 5m

Use M30 Grade of concrete and Fe 415 HYSD steel bars

Design one of the interior panels of deck slab and sketch the details of reinforcement.

3. Design mild steel rocker bearings for transmitting superstructure reactive load of 1400KN.

Allowable pressure on bearing block - 4 MPa

Permissible bending stress -165MPa

Permissible bearing stress -100 MPa

Permissible shearing stress -100 MPa

A Bed plate of size 500mm \times 1000mm cable provided.

- 4. a) With neat sketches, explain different types of bearings used in bridges.
 - b) Explain in detail about courbon's theory.
- 5. a) Discuss the major causes of bridge failures. Indicate how these failures could be avoided?
 - b) Explain the various types of Plate Girder Bridges and their suitability.
- 6. An RCC pipe culvert is proposed for a drain carrying a design discharge of 1.40 m³/s. Permissible velocity of flow is 1.50 m/s. Bed level of drain 100.00m, road formation level 103.00m, road width is 7.50m. Embankment slope is 1.5:1. Table below gives the detail of NP3 pipe and its strength.

Pipe Diameter		Reinforcement		Three edge bearing strength
Internal	External	Longitudinal	Spiral	57.48 KN/m
800mm	990mm	26.60 N/m	130.40 N/m	

Embankment load is 60 KN/m. Value of Cs = 0.025 for IRC class AA wheel load of 62.50 KN. Impact factor is 1.50, Coefficient of head loss due to friction is 0.0033 L/(R)1,3. Design the pipe culvert. Draw the cross section of pipe showing reinforcement and bedding details.

7. Design a reinforced concrete deck slab bridge for a national highway to suit the following data :

Width of the carriage way - 7.5m (two lane traffic)

Foot path on either side - 1 m

Clear span - 6m

Wearing coat - 80mm

Width of bearing-400mm

Materials - M30 grade of concrete and steel Fe415 HYSD bars

Loading - IRC class A

The design should confirm to the new code specifications using limit state method. Check for shear and design of footpath is not necessary.

- 8. a) Discuss the various types of joints with illustrations and design recommendations.
 - b) Draw a neat sketch of steel cable stayed bridge and mark its salient parts.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.