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M.Tech. Civil Engg EL-I (2016 Batch) (Sem.–2) ADVANCE BRIDGE DESIGN Subject Code : MTCE-210 Paper ID : [74303]

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. Any missing data may be assumed appropriately.
- 1. The effective span of trough type Warren truss Highway bridge for a I.R.C. : Class AA wheeled vehicles are 42 m. Warren truss consist of 7 panels @ 6 m. Design the stringer beam and cross girder with the following data:

Dead load from slab and W.C = 15 kN/m, Spacing between the stringer beam = 1.8 m

Width of roadway = 7.5 m, Kerb = 600 mm on both sides.

Rolled steel section with an yield stress of 236 N/mm^2 are available to use. (20)

- 2. a) What are the consideration for the design of an elastomeric bearing for girder bridge?
 - b) State the performance criteria for an effective joint sealing system. (10×2)
- 3. a) Sketch the reinforcement details of an R.C. precast pile of about 9m length.
 - b) Describe the modular compression sealing system and state its advantages. (10×2)
- 4. a) State what is meant by quality assurance for bridge construction. (5)
 - b) Discuss with sketch the incremental push launching method of construction and state its special merits. (7.5)
 - c) Describe an example of efficient site organisation for a prestressed concrete bridge of many spans of 35m across a major river whose bed is dry for a major part of the year.

(7.5)

5. Design a suitable masonry abutment for girder bridge. The angle of internal friction of the retained material is 45°. An approach reinforced concrete slab is provided to the bridge so that the effect of surcharge may be neglected. The angle of friction between the soil and masonry is 32°. Height of the abutment below the road level is 6 m. The positive earth pressure infront of the abutment is to be neglected. Density of masonry = $2t/m^3$ and density of concrete = 2.4 t/m^3 and density of soil = 1.8 t/m^3 . (20)

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6.	a) Explain the IRC specification for live load for IRC class 70R loading.	(4)
	b) Explain the staging method of construction of bridge deck.	(4)
	c) Discuss how you compute the seismic forces on a bridge.	(4)
	d) Define normal depth of scour.	(4)
	e) Justify the selection of a prestressed concrete bridge for long span.	(4)

7. Design a welded deck type plate girder bridge deck for a B.G. track to suit the following :

Effective span: 45 m

Dead load of track =15 kN/m.

EULL for B.M calculation/track = 3398 kN

EULL for S.F calculation /track = 3915 kN.

Design the plate girder and sketch the details of cross bracing and welded connections. (20)

8. Design a R.C.C T - beam bridge to suit the following data :

Clear width of roadway = 6.4 m

Span (centre to centre of bearings) = 18m

L.L = IRC class 70 R tracked vehicle.

Avg. thickness of bearing coat = 75 mm.

Concrete mix = M 35 grade

Steel = Fe 415 grade HYSD bars.

Using the Courbon's method, compute the design moments and shears and design the deck slab and main girder. Also sketch the details of reinforcement. (20)