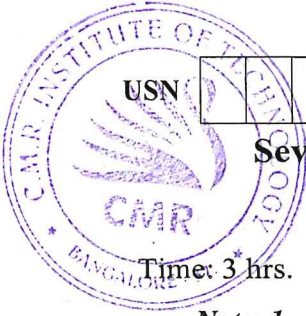


CBCS SCHEME



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15CV741

Seventh Semester B.E. Degree Examination, Aug./Sept.2020

Design of Bridges

Time: 3 hrs.

Max. Marks: 80

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IRC 6, IRC21, IS-456-2000 is permitted.
3. Sketch reinforcement details wherever necessary.

Module-1

- 1 a. Briefly discuss any three methods for computation of Peak Flood discharge. (06 Marks)
b. Write short notes on the following with respect to hydraulic design of Bridges.
Linear waterway, Economical span, Scour depth and Afflux. (10 Marks)

OR

- 2 a. Explain fixation of linear waterway in (i) streams with rigid boundaries (ii) Quasi – Alluvial soil (iii) Alluvial soil streams. (06 Marks)
b. The following levels are available from a bridge site. HFL of flow is 97.960 mtr. Calculate hydraulic mean radius using Area Velocity method.

Chainage (m)	Bed Level (m)
60	97.960
55	95.700
50	94.600
40	91.800
20	91.400
0	90.900
20	91.100
40	95.160
50	95.800
55	96.800
62	97.960

(10 Marks)

Module-2

- 3 A slab culvert is proposed across a stream in an Highway having following data:
Design the deck slab adopting M25 grade concrete and Fe 415 steel. [Shear Analysis and Footpath design not required]
Carriageway width = 7.50 m. ; Footpath width = 1.00m
Effective span of bridge deck = 6.40 mtr ; Wearing coat thickness = 80 mm
Loading = IRC Class A Two Lane loading. (16 Marks)

OR

- 4 Design the Deck slab for a culvert using below given data:
Road width = 7.50 m ; Width of kerb = 0.60 m
Effective span of deck slab = 4.40 m
Thickness of wearing coat = 80 mm
Grade of concrete = M25
Grade of steel = Fe 415
Loading = IRC Class AA Tracked. (16 Marks)

Module-3

- 5 In a State highway a T Beam Girder Bridge is to be constructed across a river. The details are as below:
 Carriageway width = 7.50 mt ;
 Kerb width = 0.60
 Kerb thickness above slab level = 0.30 mtr
 Wearing coat thickness = 0.08 mtr
 Effective span of Bridge = 16 mtr
 Live Load = IRC Class AA Tracked.
 Adopting M25 grade concrete and Fe 415 steel, design outer girder of bridge [Shear Analysis not required]. (16 Marks)

OR

- 6 a. Three Longitudinal girders at a spacing of 2.50 m c/c are provided in a Slab Girder Bridge, spanning over a Nala with c/c distance of Bearings equal to 16 mtr. Spacing of cross girders is 4.00 mtr c/c. Width of carriageway is 7.50 mtr. Footpath width is 1.00 mtr. Average thickness of wearing coat is 60 mm. Design interior panel of slab adopting M25 concrete and Fe 415 steel. IRC Loading : Class AA Tracked. (16 Marks)

Module-4

- 7 a. Draw neat sketches of Beddings for concrete pipes in pipe culverts. (03 Marks)
 b. A Single Cell Box culvert with inner dimensions of 3.50m × 3.50m is provided in a highway of 7.50 mtr wide. Thickness of earth fill over top slab is 65 cms. Live load on culvert is 45 kN/m². Angle of internal friction of soil (ϕ) is 30° and unit weight is 18.47 kN/m³. Analyze the Box frame considering Dead load, Live load and Earth pressure for NO flow condition in nala. Calculate final moments and draw BM diagrams. (13 Marks)

OR

- 8 a. Explain steps involved in structural design of pipes in a pipe culvert. (03 Marks)
 b. A single cell box culvert is to be designed for an culvert in a highway with following data:
 Box inside dimensions : 3m × 3m ; Earth fill load above top slab : 14 kN/m²
 Width of carriageway = 7.50 mtr ; IRC Live load = Class AA Tracked
 Unit weight of soil is 18 kN/m³ and angle of internal friction is 30°. Find final moments in top and bottom slab, vertical walls considering Dead Load, Live load and earth pressure combination. (13 Marks)

Module-5

- 9 a. List factors to be considered while selecting Bridge Bearings. (05 Marks)
 b. Draw typical shapes of piers commonly used in concrete bridges. List loads and forces to be considered in pier design. (11 Marks)

OR

- 10 a. Discuss main functions of a Bridge Bearing. List four major forces considered in the design of Bearings. (05 Marks)
 b. Explain any six forces considered in the design of Abutments. With necessary sketch explain stability analysis of Abutment. (11 Marks)
