P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belagavi)
Eighth Semester, B.E. - Civil Engineering
Semester End Examination; July - 2021
Design of Bridges

Time: 3 hrs   *Max. Marks: 100*

Note: *Answer any **FIVE** full questions.*

1 a.	What is the basis for classification of bridges? List three varieties of classification of bridges.	10
b.	Determine the linear water way for a bridge across a stream with a flood discharge of 225 m³/sec, velocity 1.5 m/sec and width of flow at HFL 60 m, if the allowable velocity under a bridge is 1.8 m/sec.	10
2 a.	List the ideal bridge site characteristics.	10
b.	Compute the economical span for a proposed bridge with the following cost data:	10

Span (m)	4	8	12	15
Super structure cost (Rs.)	17,000	70,000	1,60,000	2,45,000
Sub structure cost (Rs.)	22,200	23,200	23,000	23,600

3 a.	Explain with neat dimensional sketch, the IRC class AA tracked loading on the bridge.	10
b.	Explain how the longitudinal forces and temperature effects are accounted in bridge design?	10
4 a.	Explain with neat dimensional sketch the IRC class *A* and class *B* type of loading on the bridge.	10
b.	Write a note on impact and seismic loads considered in the design of bridges.	10

5. A reinforced concrete slab culvert has a span of 7.5 m with the following details:

   i) Road width = 7.5 m

   ii) Parapet on either side = 400 mm

   iii) Thickness of wearing coat = 80 mm

   iv) Width of kerb = 200 mm

   v) Live load = IRC Class AA wheeled vehicle

   vi) Materials used = M25 Grade of concrete and Fe-500 grade steel

   Design the deck slab and sketch the reinforcement details.   20

6. Reinforced concrete slab culvert has a span of 6.5 m with the following details:

   i) Road width = 7.5 m

   ii) Parapet on either side = 500 mm

   iii) Thickness of wearing coat = 100 mm

   iv) Width of kerb = 200 mm

   v) Live load = IRC Class A vehicle

   vi) Materials used = M25 Grade of concrete and Fe-500 grade steel

   Design the deck slab and the reinfocement details.   20

7. Design a box culvert for an effective span of 3.0 m with an effective height of vent 3.0 m using the following data:

   i) Road width = 7.5 m

   ii) Thickness of parapet = 450 mm

   iii) Thickness of kerb = 200 mm

   iv) Thickness of wearing cost = 80 mm

   v) Type of Live load = IRC Class AA tracked vehicle

   vi) Angle of repose 30°

   vii) Density of soil = 18 kN/m^3

   Use M40 grade of concrete and Fe-500 grade steel.   20

8. Design a Box culvert for an effective span of 4.5 m with an effective height of vent 4.5 m using the following data:

   i) Road width = 7.5 m

   ii) Thickness of parapet = 400 mm

   iii) Thickness of Kerb = 200 mm

   iv) Thickness of wearing coat = 100 mm

   v) Type of Live load = IRC Class A vehicle

   vi) Angle of repose 30°

   vii) Density of soil = 18 kN/ m^3

   Use M30 grade of concrete and Fe-500 grade steel.   20

9. Design an interior slab of a T beam bridge measuring 3m × 5m for IRC class AA tracked vehicle with M30 grade concrete and Fe-500 steel.   20

10. Design the deck slab of a RCC T-beam and slab bridge for the following details (Central girder for flexuure only):

   i) Clear road way width = 7.0 m

   ii) Effective span = 6 m

   iii) Width and depth of kerb = 450 and 220 mm

   iv) Spacing of main girder = 3 m (3Nos.)

   v) Spacing of cross girder = 3.5 m (5Nos.)

   vi) Width of main and cross girder = 300 mm

   vii) Depth of the main girder = depth of cross girder

   viii) Thickness of wearing coat = 80 mm

   ix) Parapet-Rc post (150 × 150 × 700 mm) spaceing @ 1.5 m c/c-0.7 kN/m

   x) Live load-IRC class AA tracked vehicle

   xi) Materials used M40 grade of concrete and Fe-500grade steel   20

❋ ❋ ❋ ❋