SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code : BE (13A03701) **Course & Branch**: B.Tech - CE

Year & Sem: IV-B.Tech & I-Sem **Regulation:** R13

UNIT –I

INTRODUCTION, BOXCULVERT & BRIDGE BEARING

1. Explain various types of IRC loadings in the design of highway bridges. 10M
2. Explain the importance of the site investigation of the bridge design. 10M
3. (a) What are the various loads to be considered for designing a Highway bridge? 04M
   (b) Sketch IRC class AA (Tracked Vehicle) loading giving clearances, dimensions and contact area with salient note as per IRC 6-2000? 06M
4. (a) Write a brief note on 'Impact Factor' for various bridge loading standards. 05M
   (b) What is the preliminary data required for designing a Highway Bridge. 05M
5. Explain the various loading cases of the box culvert with neat diagram. 10M
6. Design a reinforced concrete box culvert having a clear vent way of 3m by 3m. The superimposed dead load on the culvert is 12.8 kN/m^2. The live load on the culvert is $70kN/m^2$, density of soil at site is $18kN/m^3$ and angle of repose of soil is 30^o. Adopt M-20 grade concrete mix & Fe-415 grade tor steel. And also sketch the details of reinforcement. 10M
7. Design a box culvert having inside dimensions of 3m×3m, this culvert is subjected to a dead load of 14 kN/m^2 and a live load of IRC class AA tracked vehicle. Assume, the unit weight of soil is $18kN/m^3$. The angle of repose of soil is 30^o. Use M25 concrete & Fe415 grade HYSD bars (Assume, road width is 7.5m). 10M
8. Design a steel rocker bearing for transmitting a vertical reaction of 1000 kN and a horizontal reaction of 100 kN at the support of a bridge girder, assuming the following permissible stresses according to IRC: 83-1982.
   Permissible compressive stress in concrete bed block = 5 N/mm^2
   Permissible bending stress in steel plate = 165 N/mm^2
   Permissible bearing stress in steel plate = 190 N/mm^2
   Permissible shear stress in steel = 110 N/mm^2
   Sketch the typical details of the rocker bearing.
9. Design an elastomeric bearing to support a T-beam girder of a major bridge using the following data:
   Maximum dead load reaction/bearing = 340 KN
   Maximum live load reaction/bearing = 550 KN
   Longitudinal force due to friction for each bearing = 35 KN
   Effective span of the girder = 23 m

Estimated rotation at bearing of the girder due to dead & live loads = 0.003 radians, M20 grade concrete is used. Total estimated shear strain due to creep, shrinkage and temperature = 5×10^{-4} units. Draw the details of the bearing. 10M

10. a) List out the importance of the site investigation of the bridge design. 02M
    b) What are loading standards used for the highway bridges? 02M
    c) Define impact factor. 02M
    d) Write the general features of bearings used in the bridge. 02M
    e) List out the various types of fixed and expansion bearings. 02M

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1. The standard IRC bridge loadings specified in [ ]
   (A) IRC: 21-2000 (B) IRC: 6-2000 (C) IRC: 83-1999 (D) IRC: 83-1999
2. The impact factor for concrete bridges [ ]
   (A) $\frac{4.5}{(6+L)}$ (B) $\frac{9}{(13.5+L)}$ (C) Both (D) None
3. The impact factor for steel bridges [ ]
   (A) $\frac{4.5}{(6+L)}$ (B) $\frac{9}{(13.5+L)}$ (C) Both (D) None
4. The maximum compressive strain in concrete in axial compression is [ ]
   (A) 0.003 (B) 0.0035 (C) 0.002 (D) None
5. For a broad gauge used in Indian railways, the width of track is ____mm [ ]
   (A) 1000 (B) 1500 (C) 762 (D) 1676
6. For a narrow gauge used in Indian railways, the width of track is ____mm [ ]
   (A) 1000 (B) 1500 (C) 762 (D) 1676
7. For a meter gauge used in Indian railways, the width of track is ____mm [ ]
   (A) 1000 (B) 1500 (C) 762 (D) 1676
8. The effective span of the RCC bridge is 6m, then the impact factor for IRC classAA tracked loading is ____% [ ]
   (A) 10 (B) 19.55 (C) 19.75 (D) 25
9. The effective span of the RCC bridge is upto 5m, then the impact factor for IRC classAA tracked loading is ____% [ ]
   (A) 10 (B) 19.55 (C) 19.75 (D) 25
10. The minimum cross sectional area of longitudinal reinforcement shall be not less, (for RCC columns)
    (A) 0.8% (B) 1.0% (C) 4% (D) 6% [ ]
11. The ground contact width of the IRC classAA tracked vehicle is ____m. [ ]
    (A) 1.0 (B) 1.20 (C) 0.85 (D) 0.90
12. In the design of submerged masonry or concrete structures, the buoyancy effect through pore pressure may be limited to ____% of full buoyancy. [ ]
    (A) 20 (B) 25 (C) 30 (D) 15
13. The IRC classAA tracked vehicle of Total load ____kN. [ ]
    (A) 1000 (B) 700 (C) 350 (D) 500
14. In box culvert, the thickness of slab generally adopted is [ ]
    (A) L/20 to L/15 (B) L/10 to L/15 (C) L/20 (D) None of these
15. If the angle of repose of soil is given by 30^o, then coefficient of active earth pressure is
    (A) 3 (B) 1/2 (C) 1/3 (D) 2 [ ]

16. In box culvert, the height of water level is 4.5m, then intensity of water pressure is _____kN/m^2
(A) 30 (B) 60 (C) 45 (D) 50 [ ]

17. The clear carriage way width for two lane state highway bridge generally adopted is
(A) 7.50m (B) 4.25m (C) 12.0m (D) None [ ]

18. Concentrated load (W) on the slab of box culvert [ ]
(A) 3PI/e (B) PI/2e (C) PI (D) PI/e

19. When the culvert is full with water, a maximum pressure intensity, p=____ (where, w= density of water & h= depth of flow). [ ]
(A) wh^2 (B) w/h (C) wh (D) w/h^2

20. Expansion bearings accommodate that [ ]
(A) Horizontal movements (B) Rotations (C) Vertical movements (D) Both A&B

21. Fixed bearings permit _____ [ ]
(A) Horizontal movements (B) Rotations (C) Vertical movements (D) Both A&B

22. Maximum shear stress for turned, fixed bolts and pins is [ ]
(A) $0.43f_y$ (B) $0.42f_y$ (C) $0.45f_y$ (D) $0.41f_y$

23. The minimum diameter of the roller shall be not less than __mm [ ]
(A) 65 (B) 75 (C) 55 (D) 44

24. The hardness value should be in the range of _____ [ ]
(A) (60±5) IRHD (B) (50±5) IRHD (C) 70 IRHD (D) None

25. In case of major bridges, the cost of bearings are in the range of ____ % of the total cost of the bridge [ ]
(A) 5 to 10 (B) 10 to 15 (C) 15 to 20 (D) None

26. In steel roller cum rocker bearing, the diameter of rollers generally preferred as [ ]
(A) 75mm (B) 100mm (C) 100 to 150mm (D) None of these

27. The oldest bridge still standing is a pedestrian stone slab bridge which is built across were Miles riverin ------ [ ]
(A)Switzer land (B) Turkey (C) India (D) China

28. If the length of the bridge is <6m then it is called as----- [ ]
(A)Major bridge (B) Culvert (C) Minor bridge (D) Deck bridge

29. If the length of the bridge lies b/n 6m to 60 then it is called as----- [ ]
(A)Major bridge (B) Culvert (C) Minor bridge (D) Deck bridge

30. If the length of the bridge is >60m then it is called as----- [ ]
(A) Major bridge (B) Culvert (C) Minor bridge (D) Deck bridge

31. A structure providing passage over an obstacle without closing the way beneath is known as---
(A)Dam (B) Bridge (C) Reservoir (D) Barrage [ ]

32. Road or railways over a valley are known as ---- [ ]
(A)Aquiduct (B) Bridge (C) Viaduct (D) Footpath

33. The box culvert is analyzed for [ ]
(A)Moments (B) Axial thrusts (C) Shear forces (D) All

34. In loading cases, for two different ratios of (L/H) [ ]
(A) 2&2.5 (B) 1&1.5 (C) 3&3.5 (D) 4&4.5

35. The fixed end moments developed for--- different loading cases [ ]
(A) 6 (B) 5 (C) 10 (D) 20

36. The shear modulus of the elastomeric bearing shall be not less than [ ]
(A) $1.2N/mm^2$ (B) $0.8\ N/mm^2$ (C) $0.6\ N/mm^2$ (D) $0.4\ N/mm^2$

37. The ratio of overall length to breadth should be equal to or less than [ ]
(A) 5 (B) 4 (C) 3 (D) 2
38. The overall thickness of the bearing should be in the range of ----and---- of the overall brea
(A) 1/5, 1/10 (B) 1/6, 1/8 (C) 1/10, 1/5 (D) 1/8, 1/6 [ ]
39. Chloroprene rubber is also known as [ ]
(A)Poly propylene (B) Iso propylene (C) Neoprene (D) None
40. The shear modulus of the elastomeric bearing shall be not less than [ ]
(A) 1.0N/mm^2 (B) 0.8 N/mm^2(C) 0.6 N/mm^2 (D) 0.4 N/mm^2

Prepared by: **M.MANIKANTAN**