

Reg. No.

Question Paper Code

12075

24 JUL 2023

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL/MAY 2023

Fourth Semester

Civil Engineering

20CEPC404 - HIGHWAY ENGINEERING

(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

- | | <i>Marks,
K-Level, CO</i> |
|--|-------------------------------|
| 1. What are the requirements of an ideal alignment? | 2,K1,CO1 |
| 2. Summarize a short note on road ecology. | 2,K2,CO1 |
| 3. Define superelevation. | 2,K1,CO2 |
| 4. Compare summit and valley curves. | 2,K2,CO3 |
| 5. Explain rigidity factor in the design of Highway Pavements. | 2,K2,CO4 |
| 6. List the components of the flexible pavements with neat sketch. | 2,K2,CO4 |
| 7. What are the different forms of Bitumen? | 2,K1,CO5 |
| 8. What is mud pumping in rigid pavements? | 2,K1,CO5 |
| 9. Define annual cost. | 2,K2,CO6 |
| 10. What are the types of models in DBFOT? | 2,K1,CO6 |

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) Compare the three twenty year road development plan in India. 13,K2,CO1
- OR**
- b) Explain in detail about the engineering surveys conducted for highway alignment. 13,K2,CO1
12. a) Explain about traffic safety and road signs in detail. 13,K2,CO3
- OR**
- b) A descending gradient of 1/30 meets an ascending gradient of 1/40 to form a valley curve. Calculate the length of the curve. Take SSD as 150 m. 13,K3,CO3
13. a) Explain the CBR method of design of flexible pavements. 13,K2,CO4
- OR**

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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b) Identify the stresses at interior, edge and corner region of cement concrete pavement using Westergaard's equation. Use the following data. Wheel load = 5200 kg, Pavement thickness=20 cm, Poisson's ratio of concrete=0.15, Subgrade Modulus=6 kg/cm³, E=3x10⁵ kg/cm², Radius of contact area=15cm². 13,K3,CO4

14. a) Explain the principle and uses of Benkelman beam test and Describe the complete procedure of carrying out Benkelman beam test to evaluate the pavement. 13,K2,CO5

OR

b) Briefly explain the ductility test and softening point test. 13,K2,CO5

15. a) Calculate the benefit cost ratio and feasibility of a project for widening a stretch of single lane road of length 40km to two lanes with earthen shoulders at a total cost of Rs.125 lakhs per km and the rate of interest is 10% per year. The annual cost of maintenance of the existing single lane road is Rs.21,000 per km and that of the improved two lane is Rs. 75,000 per km. The average vehicle operation cost on the existing road is Rs.4 per vehicle-km and that on the widened road is estimated to be Rs.3 per vehicle-km. if the present traffic is 6000 motor vehicles per day and by the end of 15 years design period the traffic is estimated to be doubled, Determine whether the investment on the improvement of the road is economically viable, during the 15 years period. 13,K2,CO6

OR

b) Explain the highway projects under PPP and its types. 13,K2,CO6

PART - C (1 × 15 = 15 Marks)

16. a) The radius of the horizontal curve is 120 m, The design speed is 60 kmph and the design coefficient of lateral friction is 0.15. 15,K3,CO2
(i) Calculate the super elevation required
(ii) Calculate the Coefficient of friction if no super elevation is provided.

OR

b) Explain the highway cross sectional elements with a neat sketch. 15,K2,CO2