

Reg. No.

24 JAN 2023

Question Paper Code

11672

**B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022**

Fourth Semester

**Civil Engineering**

**20CEPC404 - HIGHWAY ENGINEERING**

(Regulations 2020)

(Use of CBR and IRC charts are permitted)

Duration: 3 Hours

Max. Marks: 100

**PART - A (10 × 2 = 20 Marks)**

Answer ALL Questions

- |  | <i>Marks,<br/>K-Level,CO</i> |
|--|------------------------------|
| 1. Mention any two recommendations of Jayakar Committee.       | 2,K1,CO1                     |
| 2. What are the objectives of highway planning?                | 2,K2,CO1                     |
| 3. Write a short note on PIEV theory.                          | 2,K2,CO2                     |
| 4. What is the maximum and Minimum super elevation?            | 2,K2,CO2                     |
| 5. What is ESWL?   | 2,K2,CO4                     |
| 6. What is rigidity factor in the design of Highway pavements? | 2,K2,CO4                     |
| 7. What is the significance of CBR test?                       | 2,K2,CO5                     |
| 8. Write short notes on Pavement Evaluation.                   | 2,K2,CO5                     |
| 9. Define Highway cost.  | 2,K2,CO6                     |
| 10. List out the advantages of highway projects under PPP.     | 2,K1,CO6                     |

**PART - B (5 × 13 = 65 Marks)**

Answer ALL Questions

- |   |           |
|---|-----------|
| 11. a) Write a detailed note on the history of Highway development in India.  | 13,K2,CO1 |
| <b>OR</b>   |           |
| b) (i) Write a brief note on the factors controlling highway alignment.   | 7,K2,CO1  |
| (ii) Explain the classification of urban roads with neat sketches.  | 6,K2,CO1  |
| 12. a) Explain the factors affecting the sight distance.  | 13,K2,CO2 |
| <b>OR</b>   |           |
| b) Explain in detail about the highway cross section elements.  | 13,K2,CO2 |
| 13. a) Calculate the stresses at interior, edge and corner region of cement concrete pavement using Westergaard's equation. Use the following data. | 13,K3,CO4 |
| Wheel Load = 5200 kg  |           |

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

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Pavement Thickness = 20cm  
Poisson's ratio of concrete = 0.15  
Subgrade Modulus =  $6\text{kg/cm}^3$   
Young's Modulus of cement concrete =  $3 \times 10^5 \text{ kg/cm}^2$   
Radius of contact area = 15cm.

**OR**

- b) Design the flexible pavement for construction of a new bypass with the following data: *13,K3,CO4*
1. Two lane carriage way
  2. Initial traffic in the year of completion of construction = 300 CVPD(sum of both direction)
  3. Traffic growth rate = 6.0% per day
  4. Design life = 10 years
  5. Vehicle damage factor based on axle load survey = 2.5 standard axle per commercial vehicle
  6. Design CBR of subgrade soil = 5%.

14. a) Explain any three tests on bitumen. *13,K2,CO5*

**OR**

- b) Explain in details the Pavement Management System (PMS) with its effectiveness in pavement maintenance. *13,K2,CO5*

15. a) Compare the annual costs of a 2 lane road for two types of pavement structures, (i) WBM with thin bituminous surface at total cost of Rs.135 Lakhs per km, life of 5 years, interest at 10%, salvage value of Rs.20 Lakhs after 5 years; annual average maintenance cost of Rs. 0.45 Lakhs per km and (ii) WMM base with DBM binder course and bituminous concrete surface, total cost of Rs.220 Lakhs, life of 15 years, interest at 8%, salvage value of Rs.55 Lakhs at the end of 15 years; annual average maintenance cost Rs. 0.90 Lakhs per km. *13,K3,CO6*

**OR**

- b) Explain the various method of Economic analysis in highway projects. *13,K2,CO*

**PART - C (1 × 15 = 15 Marks)**

16. a) A Valley curve is formed due to two gradients +2.5% and -1.75%. If the design speed of this highway is 80kmph. Determine the stopping sight distance and design the valley curve to fulfill both comfort and head light distance conditions. *15,K3,CO3*

**OR**

- b) Derive an expression for calculating the length of summit curve & Valley curve with neat sketch. *15,K2,CO3*