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Question Paper Code : 50348

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

Sixth Semester

Civil Engineering

CE 8604 – HIGHWAY ENGINEERING

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the significance of soil suitability analysis?
2. State the objectives of the Indian Road Congress.
3. Differentiate between lag or reaction distance and braking distance
4. State requirements of an ideal transition curve.
5. What is rigidity factor in the design of Highway Pavements?
6. Mention the types of joints in rigid pavements.
7. State the purpose of applying tack coat in bituminous road construction.
8. How will you calculate the CBR value of highway materials?
9. Define the term "Highway Project Formulation."
10. What is meant by pavement serviceability index?

PART B — (5 × 13 = 65 marks)

11. (a) Describe the various classification of highways and their locations and functions.

Or

- (b) Explain in detail the engineering surveys conducted for highway alignment.

12. (a) Calculate the stopping sight distance required to avoid a head-on collision of two cars approaching opposite directions at 65kmph and 75kmph. Assume that the reaction time of drivers is 3 secs and the co-efficient between the road surface and tyres be 0.41.

Or

- (b) A National highway passing through a rolling terrain has a horizontal curve of a radius of 250m. If the design speed is 90 kmph, calculate super elevation, extra widening stopping sight distance and intermediate sight distance. Assume any other necessary data suitably.
13. (a) Explain in detail the various factors influencing the design of rigid pavements and the design procedure as per the IRC method.

Or

- (b) Describe in detail the IRC method of flexible pavement design. Discuss the limitation of this method.
14. (a) Explain the modern construction materials used for the construction of pavements and their characteristics and usage in detail.

Or

- (b) Explain in detail the surface and sub-surface drainage systems of roads with neat sketches.
15. (a) Describe in detail the symptoms, causes, and remedial measures for the different types of failure in flexible pavements.

Or

- (b) Illustrate in detail the methods employed for the evaluation of pavements.

PART C — (1 × 15 = 15 marks)

16. (a) Design the pavement for the construction of a new bypass with the following data:

Two lane carriageway, Initial traffic in the year of completion of

Construction = 400 CVPD (sum of both directions),

Traffic growth rate = 8%.

Design life = 20 years,

Vehicle damage factor based on axle load survey = 3.0

Standards axle per commercial vehicle, and

Design CBR of subgrade soil = 4%.

Or

- (b) The design speed of a highway is 80 kmph. There is a horizontal curve of a radius of 200m on this road.

If the maximum superelevation of 1 in 15 is not to be exceeded, calculate the maximum allowable speed on the curve.

Also, determine the extra widening required and the length of the spiral transition curve using the following data.

Length of the wheelbase = 6.1m,

Pavement width = 7.2m,

Number of lanes = 2.

The rate of introduction of superelevation is 1 in 200.