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## Question Paper Code: 44103

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Fourth Semester

Civil Engineering

14UCE403 - HIGHWAY ENGINEERING

(Regulation 2014)

Duration: Three hours                                      Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1.  IRC was setup in the year

    (a) 1930            (b) 1934            (c) 1940            (d) 1943

2.  Border Roads Organisation for hilly regions, was formed in

    (a) 1947            (b)  1954           (c)  1958           (d) 1960

3.  Carriageway width for a single lane is

    (a) 3 m             (b) 4 m             (c) 3.8 m           (d) 2.5 m

4.  The type of transition curves generally provided on hill roads, is

    (a)  circular                           (b)  cubic parabola
    (c)  Lemniscate                         (d) spiral

5.  Design of flexible pavements is based on

    (a) mathematical analysis
    (b) empirical formulae
    (c) compromise of pure theory and pure empirical formula
    (d) none of these

6. The thickness of a pavement may be reduced considerably by

    (a) compaction of soil                (b) stabilisation of soil

    (c) drainage of soil                  (d) all the above

7. Percentage of free carbon in bitumen is

    (a) more than that in tar          ´ (b) less than that in tar

    (c) equal to that in tar             (d) none of the above

8. Which of the following tests measures the toughness of road aggregates?

    (a) crushing strength test           (b) abrasion test

    (c) impact test                    (d) shape test

9. Reflection cracking is observed in

    (a) Flexible pavement

    (b) Rigid pavement

    (c) Rigid overlay flexible pavement

    (d) Bituminous overlay over cement concrete pavement

10. Deflection measurement is done by

    (a) speedometer                   (b) Benkelman Beam

    (c) Thickness gauge             (d) Deflecto meter

<center>PART - B (5 x 2 = 10 Marks)</center>

11. List out the factors influencing highway alignment.

12. Define stopping sight distance.

13. Mention three grades of bitumen in general use on road work and state where and why each grade is suitable.

14. What are the desirable properties of Bitumen?

15. Define skid resistance.

<center>PART - C (5 x 16 = 80 Marks)</center>

16. (a) Explain the various conventional engineering surveys for highway alignment.    (16)

<center>Or</center>

<div align="right">**44103**</div>

(b) (i) Describe the factors governing highway alignment. (8)

(ii) Write brief note on Highway Development in India. (8)

17. (a) The design speed on a road with curve of radius 400m is 90 kmph. The coefficient of friction is 0.15. Calculate :

(i) super Elevation for full lateral friction

(ii) coefficient of friction when no super elevation is provided

(iii) Super election for equal pressure at inner and outer wheels (16)

Or

(b) The design speed of a high way of 10 *kmh*. there is a horizontal curve of radius 200 *m* on a certain locality. Calculate the super elevation receded to maintain this speed. If maximum super elevation allowable speed on this horizontal curve as it is not possible to increase the radius. The safe limit transverse co-efficient of friction is 0.15. (16)

18. (a) (i) Design of flexible pavements: Which is located in hilly area present traffic intensity is 350 vehicles for a design period of 8 years and a traffic growth rate of 7.5% take lane distribution factor as 0.75 take VDF 2.5; design of CBR value for soil subgrade is 10%. (8)

(ii) Discuss the merits and demerits of CBR method of flexible design. (8)

Or

(b) Discuss the IRC Recommendations for design of cement concrete pavements. (16)

19. (a) List the types of bituminous roads. Explain the bituminous macadam type of road construction. (16)

Or

(b) (i) Explain different materials used for polymer modified bitumen. (8)

(ii) Explain construction of cement concrete road. (8)

20. (a) Explain various types of failures in Rigid pavements. (16)

Or

(b) Explain the various surface defects in flexible pavements. Also mention their causes. (16)

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**44103**