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**Question Paper Code: 44103**

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

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)

- The road foundation for modern highways construction, was developed by
  - tresguet and telford simultaneously
  - telford
  - telford and macadam simultaneously
  - macadam
- The sequence of four stages of survey in a highway alignment is
  - reconnaissance, map study, preliminary survey and detailed survey
  - map study, preliminary survey, recon-naissance and detailed survey
  - map study, reconnaissance, preliminary survey and detailed survey
  - preliminary survey, map study, recon-naissance and detailed survey
- Carriageway width for a single lane is
  - 3 m
  - 4 m
  - 3.8 m
  - 2.5 m
- The type of transition curves generally provided on hill roads, is
  - circular
  - cubic parabola
  - Lemniscate
  - 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. Aggregate impact test is used to evaluate
 

(a) percentage wear	(b) Toughness
(c) Crushing strength	(d) water absorption percentage
  
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. Intermediate catch water drains are provided only, if
  - (a) catchment area of the watershed above road is large
  - (b) intensity of rainfall is heavy
  - (c) single catch water drain is inadequate
  - (d) all the above

PART - B (5 x 2 = 10 Marks)

11. Define Kerb. What is its purpose?
12. What are the three condition based on design of sight distance at intersection?
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.

PART - C (5 x 16 = 80 Marks)

16. (a) Describe the history of developments of Highway in India based on Jayakar committee and twenty year road development plan. (16)

Or

(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) Explain the different types of gradients. (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) (i) Design the flexible pavement for the construction of a new highway with the following data:

(1) Category of road : four lane dual carriageway

(2) Number of commercial vehicles in the year : 5600 commercial vehicles completion of construction per day per direction

(3) Annual growth rate of commercial vehicles : 8%

(4) Design life : 15 years

(5) Design CBR of sub-grade soil : 5% (8)

(ii) Compare rigid and flexible pavements. (8)

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

Or

(b) (i) Explain the various sub surface drainage system with neat sketches. (8)

(ii) Explain the construction procedure of cement concrete road as per IRC specification. (8)

20. (a) Briefly explain the maintenance management system? (16)

Or

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

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