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**Question Paper Code: U4105**
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B.E./B.Tech. DEGREE EXAMINATION, NOV 2023

Fourth Semester

Civil Engineering

21UCE405 HIGHWAY ENGINEERING

(Regulations 2021)

Duration: Three hours                                      Maximum: 100 Marks

Answer All Questions

PART A - (10 x 1 = 10 Marks)

1. The Width of the three lane road is                                      CO1 -U

   (a) 10.5m            (b) 15 m            (c) 11.5m            (d) 9m

2. Nagpur plan is also known as                                      CO1-U

   (a) CE's conference                        (b) First 20 year plan

   (c) Second 20 year plan                    (d) Third 20 year plan

3. The ruling design speed on a NH as per IRC is                                      CO1- U

   (a) 80 Kmph          (b) 100 Kmph          (c) 120 Kmph          (d) 140 Kmph

4. Head light distance is influenced by                                      CO1- U

   (a) OSD              (b) SSD              (c) ISD              (d) Vehicle speed

5. Construction joints are used in                                      CO1- U

   (a) Flexible pavements    (b) Rigid pavements    (c) Overlays    (d) Fillings

6. Natural sand, gravel, laterite, brick metal, crushed stone are used for                                      CO1-U

   (a) Sub-base          (b) base course          (c) surface course          (c)finishing

7. Camber provided in water bound macadam road is                                      CO1-U

   (a) 1 in 33          (b) 1 in 40          (c) 1 in 25          (d) 1 in 13

8. Impact test values are used for ………….course                                      CO1-U

   (a) Base course          (b) Surface course          (c) sub base          (d) wearing course

9. Most common failures in flexible pavement are                                              CO1- U

    (a) Diagonal cracks    (b) Potholes, gullys    (c) sinking of pavement    (d) grouting effect

10. Pavement serviceability Index denotes                                                       CO1-U

    (a) strength of pavement                    (b) maintenance frequency of pavement

    (c) skid resistance                         (d) weakness of pavement

<div align="center">PART – B (5 x 2= 10 Marks)</div>

11. Identify the factors influencing the  ideal alignment for a NH                              CO1- U

12. Differentiate between Road and pavement                                                      CO1- U

13. Name the factors influencing the design of flexible pavements.                              CO1- U

14. Infer the merits of concrete roads  over bituminous pavements                               CO1 -U

15. Explain the methods of strengthening damaged pavements.                                     CO1- U

<div align="center">PART – C (5 x 16= 80 Marks)</div>

16. (a) Describe the conventional and modern methods of engineering surveys to be carried out for highway location fixing.  CO1- U  (16)

<div align="center">Or</div>

    (b) Justify the need for considering various factors which influencing the ideal alignment of a highway, with a case study of Madurai-Melur Highway.  CO1 -U  (16)

17. (a) Justify the relevance of the PIEV theory (reaction time, breaking and lag distance) in Passing and Non-passing sight distance estimation on horizontal curves.  CO2 -App  (16)

<div align="center">Or</div>

    (b) Justify the role of various gradient based configurations of the Valley curves and Summit curves. Calculate the length of summit curve formed when +1/150 and -1/200 are met, with the height of the drivers eye above road is 1.5m, height of the object on the road is 1.2m. with a stopping sight distance of 25m.  CO2 -App  (16)

18. (a) Compare warping stress and frictional stress in rigid pavement. Explain the structural requirement of  a rigid pavement  CO3 -App  (16)

<div align="center">Or</div>

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(b) A CC pavement 20 cm thick and 7.5 m width has a longitudinal CO3 -App (16) joint along the centre line. Design the diameter, length and spacing of the tie bars, if the allowable stress in steel is 1400 $Kg/cm^2$ in tension, allowable bond strength of deformed bars in concrete is 24.6 kg /$cm^2$

19. (a) Describe the step by step procedure in construction of bituminous CO1- U (16) road.

<div align="center">Or</div>

(b) Describe the step by step procedure in construction of water CO1 -U (16) bound macadam road.

20. (a) Elaborate the common failures that occur in concrete pavements, CO1- U (16) suggest suitable remedial measures.

<div align="center">Or</div>

(b) Classify the pavements based on PSI and serviceability?    CO1- U    (16)

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