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**Question Paper Code: U4105**

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2024

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. Formula for estimating the length of NH and SH is recommended by CO1 - U  
(a) First 20 year plan      (b) Mumbai plan      (c) Five year plan      (d) Lucknow plan
3. The degree of the circular curve is 20 Degree. Estimate the radius of CO1 - U  
the curve  
(a) 86 m                      (b) 96 m                      (c) 106m                      (d) 116 m
4. Non-passing sight distances considers the ..... CO1 - U  
(a) Vehicle speed      (b) Vehicle mix      (c) Climate      (d) Composition
5. Construction joints are used in CO1 - U  
(a) Flexible pavements      (b) Rigid pavements      (c) Overlays      (d) Fillings
6. Commonly used wearing courses are CO1 - U  
(a) Surface dressing      (b) Premix carpet      (c) Semi-dense      (d) Sub base
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. Benkelman beam is used to measure CO1 - U  
 (a) Structural cracks (b) Diagonal cracks (c) undulations (d) potholes
10. Mud pumping is one of the..... CO1 - U  
 (a) Popular failure occur in rigid pavement (b) Pumping procedure  
 (c) Providing mud to the base course (d) Strengthening measure

PART – B (5 x 2= 10 Marks)

11. Differentiate between rural roads and urban roads in terms of carriage way spacing CO1- U
12. A vehicle travelling at a speed of V kmph applies break for 20 seconds to stop the vehicle. Speed value varied from, 45 kmph and 100kmph. Analyze the impact of a vehicle speed on breaking distance with the above case. CO2-App
13. What are the limitations of the IRC method of pavement design. CO1- U
14. Suggest the range of impact value of aggregate suitable for surface course of flexible pavement. CO1- U
15. How to classify the bitumen based on this physical characteristics CO1- U

PART – C (5 x 16= 80Marks)

16. (a) Analyse the role of any four Institutions formed based on the recommendations of the Jayakar committee in Road development initiatives of the government. CO6- Ana (16)
- Or
- (b) Is there any correlation between speed of the vehicle and carriage way width of road. Sketch out the cross section of various urban roads with their design speeds. CO6- Ana (16)
17. (a) Derive the formula for calculating super elevation on horizontal curves and calculate the super elevation to be provided on the curve of 220m radius with design speed of 60kmph. CO2- App (16)
- Or
- (b) Justify the relevance of the PIEV theory (reaction time, breaking and lag distance) in Passing and Non-passing sight distance estimation on a horizontal curves. CO2- App (16)

18. (a) Design the pavement for construction of a new by-pass with the following data: Two lane carriage way, Initial traffic in the year of completion of construction = 1500 CVPD (sum of both directions), Traffic growth rate = 5% Design life = 15 years, Vehicle damage factor based on axle load survey = 2.5 standard axles per commercial vehicle. Design CBR of subgrade soil = 6%. CO3- App (16)
- Or
- (b) Design the pavement for construction of a new by-pass with the following data: Two lane carriage way, Initial traffic in the year of completion of construction = 1300 CVPD (sum of both directions), Traffic growth rate = 5% Design life = 10 years, Vehicle damage factor based on axle load survey = 2.5 standard axles per commercial vehicle. Design CBR of subgrade soil = 6%. CO3- App (16)
19. (a) What are quality control tests conducted on soil and aggregates used for flexible pavement? CO1- U (16)
- Or
- (b) Describe the tests used for checking the suitability of aggregates in making gravel road and WBM road. Justify your answer with neat sketches. CO1- U (16)
20. (a) Describe any 5 types of failures commonly occur in flexible pavement with neat sketches also suggest suitable remedial measures CO1- U (16)
- Or
- (b) Elaborate the common failures that occur in flexible pavements, suggest suitable remedial measures. CO1- U (16)

