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Question Paper Code: U4105

B.E./B.Tech. DEGREE EXAMINATION, NOV 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. 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
2. Jayakar committee is formed for CO1 - U
(a) Road development plan (b) Recommendation for institutions such as IRC,CRRI
(c) Speed limits (d) Toll collection
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 forcourse CO1 - U
 (a) Base course (b) Surface course (c) Sub base (d) Wearing course
9. Skid resistance is tested on pavement to ensure CO1 - U
 (a) Check the friction of wet surfaces
 (b) Check the resistance of wet and dry surfaces
 (c) Check the friction resistance of dry surfaces
 (d) Check the slope of pavement
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. Correlate between CBR of the road materials and thickness of the pavement CO1- U
14. Infer the merits of concrete roads over bituminous pavements CO1- U
15. Explain how the rescaling of cracks may be carried out in rigid pavements. CO1- U

PART – C (5 x 16= 80Marks)

16. (a) Differentiate between the Toll roads and conventional roads. Highlight the advantages and disadvantages. CO6- Ana (16)
- Or
- (b) Analyze the speed of road laying prior to independence and after independence in the light of Road development plans. 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) Determine the stresses at interior, edge and corner regions of a rigid pavement using Westergaard's method. Take $P=5000\text{KG}$; $E=3 \times 10^5 \text{ kg/cm}^2$, $h=15\text{cm}$, $\mu=0.15$, $k=4.0\text{kg/cm}^2$ and $a=10\text{cm}$ CO3- App (16)
- Or
- (b) Write down the functions of providing dowel bars and tie bars in Cement concrete pavement joints. Highlight their roles and advantages CO3- App (16)
19. (a) Analyze the various modern materials such as M-sand, P-sand, alternative materials suitability for pavement construction. CO1- U (16)
- Or
- (b) List out the most common failures occur in rigid pavements and suggest suitable remedies. CO1- U (16)
20. (a) Illustrate the principle used in Benkelman beam test to evaluate the rigid pavement with flexible overlay. CO1- U (16)
- Or
- (b) Compare the failure pattern and maintenance frequency in a road in your neighborhood. CO1- U (16)

