

ANURAG Engineering College

(An Autonomous Institution)

IV B.Tech I Semester Supplementary Examinations, April - 2024

**PAVEMENT DESIGN
(CIVIL ENGINEERING)****Time: 3 Hours****Max. Marks: 75****Section – A (Short Answer type questions)****(25 Marks)****Answer All Questions**

Course Outcome	B.T Level	Marks
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| 1. Name the two primary types of pavements commonly used in road construction. | CO1 | L1 | 2M |
| 2. Explain the functions of the base layer in a pavement system and how they differ from the surface layer. | CO1 | L2 | 3M |
| 3. Explain the calculation procedure for the stress induced in a flexible pavement using the Visco-Elastic Theory. | CO2 | L1 | 2M |
| 4. Name the assumptions and key principles of Boussinesq theory and Burmister theory for analyzing stresses in pavements | CO2 | L1 | 3M |
| 5. What are the critical locations for stress analysis. | CO3 | L1 | 2M |
| 6. Explain the influence of frictional stresses on rigid pavements and explain their significance in pavement design. | CO3 | L1 | 3M |
| 7. Explain the M–E Method to design a flexible pavement for a specific road project, considering the traffic load and sub-surface drainage. | CO4 | L2 | 2M |
| 8. List the benefits of using mechanistic-empirical pavement design methods compared to empirical methods, citing specific advantages. | CO4 | L1 | 3M |
| 9. What is the design criteria checklist for rigid pavements, including factors like joint placement and dowel bar design, as per IRC specifications | CO5 | L1 | 2M |
| 10. Explain the importance of considering the placement of the first rear axle for determining maximum edge flexural stress in rigid pavements, citing its practical implications. | CO5 | L2 | 3M |

Section B (Essay Questions)**Answer all questions, each question carries equal marks.****(5 X 10M = 50M)**

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| 11. A) Explain the factors affecting pavement selection for a given road project. Provide a real-world example to illustrate how these factors influence the choice of pavement type and design | CO1 | L3 | 10M |
| OR | | | |
| B) Calculate the design repetition for 20 years period for various wheel loads equivalent to 22.68kN. Wheel load using the following data on a four lane road. | CO1 | L3 | 10M |

Load kN	23.48	37.21	41.76	41.82	46.36	49.90	54.43
Volume per day	60	35	20	25	10	5	1

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| 12. A) Based on Burmister's theory, determine required thickness of an airfield flexible pavement using the following plate load test, Diameter of plate used=85cm ; Pressure observed at 1.25mm deflection when the plate load test is conducted on sub grade=0.82 kg/cm ² ; Pressure observed at 2.25mm deflection when the plate load test is conducted on base course of 18cm=2.1 kg/cm ² Design wheel load 35000kg, tire pressure = 28 kg/cm ² If allowable deflection is 0.125cm. | CO2 | L3 | 10M |
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OR

- B) Compare and contrast the Boussinesq theory and Burmister theory for analyzing stresses in flexible pavements. Assess their assumptions, limitations, and applicability in real-world pavement design scenarios. CO2 L3 10M
13. A) Calculate the stresses at interior, edge and corner of a cement concrete pavement by Westergaard's stress equation. Given, Modulus of elasticity of concrete = 3×10^5 kg/cm², Poisson's ratio of concrete = 0.15, thickness of concrete pavement = 18cm, Modulus of subgrade reaction = 8.5kg/cm², Wheel load = 5100kg, Radius of loaded area = 15cm CO3 L3 10M
- OR
- B) Evaluate the critical locations of wheel loads on a rigid pavement and the influence of temperature and moisture on stress distribution. Discuss how these factors impact the design of rigid pavements and provide recommendations for optimizing pavement performance. CO3 L3 10M
14. A) Describe the empirical methods used in flexible pavement design and their limitations. Provide specific examples of projects where empirical methods were applied and discuss the challenges faced. CO4 L3 10M
- OR
- B) Compare and contrast the M-E method and IRC method for flexible pavement design. Analyze the benefits of pavement design based on the M-E method and provide a critical evaluation of the design concepts and criteria in both methods CO4 L3 10M
15. A) Discuss the types of rigid pavements and the importance of pavement joints. Evaluate the mechanistic design process for rigid pavements, considering factors like edge flexural stress and tensile stress. CO5 L3 10M
- OR
- B) Explain the critical factors considered for the design of rigid pavements. Provide a detailed analysis of dowel bar design and design of tie bars as per IRC:58-2015. Discuss how these design elements contribute to pavement performance and durability. CO5 L3 10M