

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S7 (R,S) (FT) (S5 PT) Examination November 2025 (2019 Scheme).

Course Code: CET433**Course Name: HIGHWAY MATERIALS AND DESIGN****Max. Marks: 100****Duration: 3 Hours***Use of IRC 37 and IRC 58 (design codes for flexible and rigid pavements) are permitted***PART A***Answer all questions, each carries 3 marks.*

Marks

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| 1 | Explain the advantages and disadvantages of flexible pavements. | (3) |
| 2 | Differentiate between Elongation Index and Flakiness Index of aggregates. | (3) |
| 3 | List the uses of bituminous emulsion in pavement construction. | (3) |
| 4 | Explain the ageing of bitumen. | (3) |
| 5 | What are the desirable properties of bituminous mix? | (3) |
| 6 | Explain the basic principle of mechanical stabilization of soil. | (3) |
| 7 | State the assumptions made in Burmister's two layered system of pavement analysis. | (3) |
| 8 | Explain Equivalent Single Wheel Load (ESWL). How it is determined? | (3) |
| 9 | Write a short note on frictional stresses in rigid pavements. | (3) |
| 10 | Explain the functions of tie bars in concrete pavement. | (3) |

PART B*Answer any one full question from each module, each carries 14 marks.***Module I**

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| 11 | a) Explain with neat sketch different component layers of a flexible pavement and their functions? | (8) |
| | b) Explain any one graphical method of proportioning of soil-aggregate mixes. | (6) |

OR

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| 12 | a) Write short notes on artificial road aggregates with examples. | (7) |
| | b) Explain the procedure for determining crushing strength of aggregate. | (7) |

Module II

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| 13 | a) What are the various tests carried out on bitumen? Briefly explain the principles and uses of each test? | (14) |
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OR

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| 14 | a) Explain and compare the different grading systems of bitumen. | (10) |
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- b) Write a short note on cut back bitumen (4)

Module III

- 15 a) Explain the step-by-step procedure of Marshall method of bituminous mix design. (14)

OR

- 16 a) Explain the factors on which the strength characteristics of subgrade soil depend? (8)
b) Explain the test to evaluate the strength properties of soils to be used in rigid pavement construction. (6)

Module IV

- 17 a) Explain McLeod method of flexible pavement design. (4)
b) The plate bearing tests were conducted with 30 cm diameter plate on soil subgrade and over 15 cm thick base course. The pressures yielded at 0.5 cm deflection on the subgrade and base course were 1.25 kg/cm² and 4 kg/cm², respectively. Design pavement section for 4100kg wheel load with tyre pressure of 5.0 kg/cm² for an allowable deflection of 0.5 cm using Burmister's two-layer approach. *Chart given below.* (10)

OR

- 18 a) Calculate ESWL of a dual wheel assembly carrying 2045kg each for pavement thickness of 20cm, 30cm and 40 cm. Centre to centre tyre spacing is 25cm and distance between the walls of the tyres is 12cm. (4)
b) Explain the factors to be considered for design of flexible pavements. (10)

Module V

- 19 a) Explain the following with respect to design of Rigid Pavements: (9)
(i) Modulus of subgrade reaction (ii) Equivalent radius of resisting section
(iii) Radius of relative stiffness
b) Explain the Westergaard's theory and assumptions for rigid pavement. (5)

OR

- 20 a) Explain the design procedure of dowel bar system for a cement concrete pavement as per the guidelines of IRC-58-2011. (8)
b) Explain different types of joints in cement concrete pavements. (6)


