Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

M.Tech Degree S1 (R,S) Examination December 2025 (2022 scheme)

Course Code & Name:

221TCE010 || ANALYSIS AND DESIGN OF PAVEMENT SYSTEMS

Max. Marks: 60 Duration: 2.5 Hours

(Relevant IRC codes/charts are permitted)

PART A

Answer all questions. Each question carries 5 marks Marks

1 Discuss the effects of repeated applications of loads on pavements. Explain equivalent wheel load factors for load repetitions. (5)

2 Discuss the vertical stress distribution under the pavement (5)

3 List the factors affecting design performance of pavements (5)

4 Discuss Westergaard's concept of temperature stresses in concrete pavements (5)

5 Sketch the details of the following 1) Dummy contraction joint.2) A tongue and grooved warping joint (5)

PART B

Answer any 5 questions. Each question carries 7 marks

6 Explain Marshal Stability test method of mix design for bituminous mixes. Plot the sample graphs to determine optimum binder content. List out the standard specifications (7)

7 A flexible pavement of thickness 50 cm is laid over a sub grade. A circular load of radius 16cm with uniform contact pressure, 7 kg/cm^2 is applied. Assuming homogeneous elastic layer, determine the deflection of pavement surface under the center of the load. Assume the elastic modulus of the sub grade as well as pavement layer to be 1000 kg/cm^2. (7)

8 Explain AASHTO method of flexible pavement design. Compare the AASHTO method with IRC method of flexible pavement design. (7)

9 Calculate the stresses at interior, edge and corner regions of a concrete pavement using Westergaard's stress equation for the following data: Wheel load=4100 kg, tyre Modulus of elasticity of concrete=3.3*10^5 kg/cm^2 Pavement thickness=18cm, Modulus of subgrade reaction=2.5kg/cm^3 Diameter of loaded area =25cm, Poisson's ratio of concrete= 0.1 (7)

10 Design and detail dowel bars at expansion joints of a concrete pavement of thickness 20 cm, and design wheel load of 41 kN. Assume load capacity of dowel system as 40% of (7)

design wheel load. Joint width 25mm, permissible stress in dowel bars, shear stress 10kN/cm^2 and flexural stress 14kN/cm^2. Bearing stress in concrete permissible is 1kN/cm^2, assume E values for concrete and dowel to be 35000kN/cm2 and 20000 kN/cm2. K- value on sub base is 80 N/cm^3

11 Explain the need for joints in cement concrete pavements and mention the IRC guidelines for joint spacing. (7)

12 Explain different types of stresses which occur in Rigid pavements. Explain clearly how this stresses are developed and their relative significance in the design and performance of the pavements. (7)

***