

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Examination (Regular and Supplementary), December 2020

Course Code: CE467**Course Name: HIGHWAY PAVEMENT DESIGN**

Max. Marks: 100

Duration: 3 Hours

*(Use of IRC 37-2012, IRC 58-2002/2011 and design charts are permitted)***PART A***Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) What are the two soil proportioning techniques adopted in the mechanical stabilization of soils? Explain with the help of graphs. (7)
- b) Explain in detail the procedure for Modified Hubbard-Field Method for design of bituminous mixes. How is the optimum bitumen content obtained? (8)
- 2 a) State the concept of Burmister's two-layer theory. Also list the assumptions of the theory. (8)
- b) What is meant by ESWL? How is ESWL determined based on equivalent stress criterion using the graphical method? (7)
- 3 a) What are the factors to be considered in the design of flexible pavements? Mention the significance of each. (8)
- b) Explain the concept and significance of EWL factors in design of flexible pavements. (7)

PART B*Answer any two full questions, each carries 15 marks.*

- 4 a) Describe the McLeod Method of flexible pavement design in detail. (5)
- b) Using Kansas triaxial method, calculate the thickness of sub base, base and wearing surface courses from following data. Modulus of subgrade, base course and wearing course (8 cm thick) being 200 kg/cm², 600 kg/cm² and 1200 kg/cm² respectively. Given that radius of contact = 15cm and Design deflection = 0.25cm.
Assume saturation coefficient based on rainfall as 0.9 and traffic coefficient as 1.8. Wheel load = 4080 kg. (10)
- 5 a) A cement concrete pavement 15cm thick is constructed over a subgrade of k=8 kg/cm³. Maximum temperature difference between top and bottom of slab during (10)

summer mid day is 15.8°C . Spacing between transverse joint is 5m and between longitudinal joint is 3.5m. Wheel load is 4800kg, radius of loaded area is 15cm, $E=3 \times 10^5 \text{ kg/cm}^2$, $\mu=0.15$, $e=10 \times 10^{-6} /^{\circ}\text{C}$. Calculate the worst combination of stresses at edge and corner using IRC charts and Bradbury's stress coefficients.

- b) Compare warping stresses and frictional stresses in rigid pavements. (5)
- 6 a) Define the following terms with respect to rigid pavements: (8)
- (i) Radius of relative stiffness (ii) Modulus of subgrade reaction (iii) Equivalent radius of resisting section (iv) Wheel load stresses
- b) A subgrade soil has the following properties: (7)
- Soil passing 0.074 mm sieve = 60%, Liquid limit = 55%, Plastic limit = 45%
- Design a flexible pavement section using the GI method for heavy traffic with over 400 commercial vehicles per day.

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Outline the procedure for determining the thickness of the CC pavement as per IRC 58: 2002 guidelines. (12)
- b) What are the assumptions made while deciding with the spacing of dowel bars? (8)
- Also, with the help of a neat sketch explain the need of a dowel bar in transverse joints of rigid pavements.
- 8 a) Explain the principle and procedure of Benkelman Beam test. (12)
- b) What are the structural and functional requirements of a flexible pavement? (4)
- c) What are quality control tests for a rigid pavement? (4)
- 9 a) Design the dowel bar system for expansion joint of a cement concrete pavement as per the guidelines of IRC: 58- 2002 guidelines, given: (10)
- Slab thickness = 35 cm, Joint width = 2 cm, Characteristic compressive strength of cement concrete = 400 kg/cm^2 , Design wheel load = 8000 kg, Modulus of elasticity of dowel bar = $2 \times 10^5 \text{ kg/cm}^2$, Modulus of elasticity of concrete = $3 \times 10^5 \text{ kg/cm}^2$, Modulus of dowel to concrete interaction = 41500 kg/cm^3 , Radius of relative stiffness = 100 cm.
- b) What are the applications of geosynthetics in highway pavements? (5)
- c) What is meant by pavement overlay? What are the different types of pavement overlay? Mention one method of design of overlay over flexible pavements. (5)
