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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

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 permitted)

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) How is Subgrade strength assessed for design of flexible pavements? Briefly explain the test procedure. (5)
- b) Why is it necessary to consider Lateral Distribution Factor (LDF) in the estimation of traffic loads in pavement design? Substantiate the answer with neat sketches (5)
- c) Plot the trend of following in a Marshall mix design a) Voids in Mineral aggregate v/s Bitumen content; b) Voids filled with bitumen v/s Bitumen content, c) Air voids v/s Bitumen content; d) Marshall Stability v/s Bitumen content; e) Marshall Flow v/s Bitumen content (5)
- 2 a) Explain in detail the need and mix design procedure in mechanical soil stabilization. (10)
- b) Explain the concept of Equivalent Single Wheel Load (ESWL). How is ESWL determined using Equal Vertical Stress criterion (5)
- 3 a) A circular load having radius of 152 mm and uniform pressure 0.56 MPa is applied on two layer system. The subgrade has elastic modulus of 35MPa and can support a maximum vertical stress of 0.056 MPa. If bituminous layer has elastic modulus of 3500 MPa, what is the required thickness of a full depth pavement? (8)
- b) Explain how climatic variation affects pavement design and performance. (7)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) A plate bearing test using a 75cm plate was made on a subgrade as well as on 26cm of gravel base course. Unit load required to cause settlement of 0.5cm was 0.67kg/cm^2 and 2.67kg/cm^2 respectively. Determine the required thickness of base course to sustain 25000kg, 6.67 kg/cm^2 pressure and maintain a deflection of 0.5cm. (10)

- b) Discuss McLeod method of pavement design in detail. (5)
- 5 a) Explain briefly Winkler foundation used in the design of Concrete pavements. (5)
- b) List the various Empirical methods of Pavement Design? What are the drawbacks? (3)
- c) Discuss the nature of load and temperature induced stresses in a concrete slab during day time and night time. Which condition is considered to be critical in pavement design? (7)
- 6 a) Describe briefly the thermal stresses developed in Concrete slab due to seasonal variation of temperature (6)
- b) Briefly explain flexible pavement design method using IRC 37: 2012 (9)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Explain the principle and procedure of Benkelman Beam test. (10)
- b) IRC 58: 2002, for the design of JPCP pavements without tied shoulder, considers wheel load stresses to be critical when the tire imprint touches the longitudinal edge. Why? (5)
- c) How does load transfer occurs across a contraction joint in Jointed Plain Cement Concrete Pavements? (5)
- 8 a) Discuss briefly the quality control tests that a Highway Engineer needs to ensure during procurement of materials and immediately after construction of flexible pavements (10)
- b) Briefly outline IRC procedure for determining the thickness of cement concrete pavement (10)
- 9 a) A cement concrete pavement has a thickness of 18 cm and has two lanes of 7.2m with a longitudinal joint along the centre. Design the dimensions and spacing of the tie bar. Allowable working stress in tension = 1400kg/cm^2 , Unit weight of concrete = 2400kg/m^3 , Allowable bond stress in deformed bars in concrete = 24.6kg/cm^2 and coefficient of friction = 1.5 (8)
- b) Distinguish between Dowel and Tie bars used in JPCP. (6)
- c) Discuss in detail any one method each of Functional and Structural Performance assessment of Pavements (6)
