

Sub Code: **CET-604**

ROLL NO.....

**SEMESTER EXAMINATION,  
2022-23 YEAR**

Programme – Ist Yr. M.Tech – GEOTECHNICAL ENGINEERING

**PAVEMENT ANALYSIS AND DESIGN**

**Duration : 3:00 hrs**

**Max Marks: 100**

Note:-Attempt all questions. All Question carry equal marks. In case of any ambiguity or missing data, the same may be assumed and state the assumption mad in the answer.

Q 1. Answer any four parts of the following.

- a) Explain flexible and rigid pavements and bring out the points of differences.
- b) List the factors affecting design performance of pavements .
- c) Using deflection criteria, calculate the ESWL of a dual wheel assembly carrying 2044kg each for pavement thickness of 20cm. Centre to centre spacing of tyre is 27cm and tyre pressure is 6 kg/cm<sup>2</sup>.
- d) What are the various functions and desirable characteristics of pavements?
- e) Explain how the elastic modulus of subgrade and base course are estimated using plate bearing test data .
- f) Differentiate between ESWL and EWLF.
- g) Discuss the vertical stress distribution under the pavement.

Q 2. Answer any four parts of the following.

- a) List different methods of design of flexible pavement and state the principles
- b) A two lane two way carriageway carries a traffic load of 1500 cvd .The rate of growth of traffic is 5% per annum.The design life is 5 years.The vehile damage factor is 2.5.CBR value of soil is 7% .Calculate a) Cumulative number of standard axles to be used in the design b) Total pavement thickness,c) composition of the pavement.
- c) Explain the CBR and IRC methods of design of flexible pavements.Discuss the advantages and limitations.
- d) Explain Burmister's two layer and three layer theory
- e) Discuss the concept of equal vertical deflection criteria and applying deflection criteria calculate the ESWL of a dual wheel assembly carrying 20.44 kN each for pavement thickness of 15 cm. Centre to centre spacing of tyre is 27cm and tyre pressure is 60N/cm<sup>2</sup>

Q 3. Answer any two parts of the following.

- a) Discuss the design principles of rigid pavement.
- b) Calculate the stresses at interior, edge and corner regions,of a concrete pavement using Westergaards stress equation for the following data: Wheel load=4100 kg,tyre Modulus of elasticity of concrete= $3.3 \times 10^5$  kg/cm<sup>2</sup> Pavement thickness=18cm, Modulus of subgrade reaction= $2.5 \text{ kg/cm}^3$  Diameter of loaded area =25cm, Poisson's ratio of concrete= 0.15
- c) Explain the need for joints in cement concrete pavements and mention the IRC guidelines for joint spacing.
- d) Explain the development and action of temperature stress in rigid pavements.How

to reduce temperature stress in pavements.

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

**Q 4.** Answer any two parts of the following.

- a)** 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 design wheel load.Joint width 25mm, permissible stress in dowel bars, shear stress 10kN/cm<sup>2</sup> and flexural stress 14kN/cm<sup>2</sup> . Bearing stress in concrete permissible is 1kN/cm<sup>2</sup> ,K- value on sub base is 80 N/cm<sup>3</sup>.
- b)** Write a note on Pavement Maintenance Management System.
- c)** What are the methods of pavement evaluation?

**Q 5.** Answer any two parts of the following.

- a)** Describe the Benkelman Beam and its uses?
- b)** Explain white topping
- c)** Explain the stress computations in single layer, two layer and multi layer elastic theories.