**D 10652** (Pages : 2) Name.....

Reg. No.....

# SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2010

## CE 04 705 (D)—PAVEMENT DESIGN

Time : Three Hours Maximum : 100 Marks

*Answer* **all** *questions.*
*Missing data, if any, may suitably be assumed.*
*IRC codes are permitted.*

I. (a) Explain the different types of pavements and their components with figures.

(b) How does climatic variations affect the pavement design and performance ?

(c) Write a note on empirical approaches for flexible pavement design.

(d) Explain ESWL and the concept in the determination of equivalent load.

(e) Differentiate between rigid and flexible pavements with neat sketches.

(f) Explain the design considerations for spacing of contraction joints with and without reinforcement.

(g) Explain for a design approach for strengthening existing pavements.

(h) Name the types of failures commonly seen in pavements.

(8 × 5 = 40 marks)

II. (a) Discuss the effects of repeated load application on pavements. Explain EWL factors for load repetitions.

(8 marks)

(b) Explain Group Index and its use in rating a subgrade soil. (7 marks)

*Or*

(c) Discuss the importance of gross wheel load and contact pressure in stress distribution pattern and in pavement design.

(7 marks)

(d) How will you determine the optimum binder content and required gradation using Marshall method of bituminous mix design ?

(8 marks)

III. (a) Classify the various design methods for flexible pavements. (8 marks)

(b) Calculate the Group Index given :

(i) Liquid Limit = 60%

(ii) Plastic Limit = 35%

(iii) Passing 200 mesh sieve = 60%. (7 marks)

*Or*

**Turn over**

(c) Establish the relationship : $T = k \log_{10} (P/S)$. (7 marks)

(d) Design a highway pavement for a wheel load of 4100 kg with a tyre pressure of 5 kg/cm$^2$ using McLeod method. Plate bearing test carried on the subgrade soil using 30 cm diameter plate yielded a pressure of 2.5 kg/cm$^2$ after 10 repetitions of load at 0.5 cm deflection. (8 marks)

IV. (a) Explain the effect due to expansion and contraction of cement concrete slabs and discuss the types of stresses induced. (9 marks)

(b) Explain and give the significance of :

(i) Radius of relative stiffness.

(ii) Radius of resisting section. (6 marks)

*Or*

(c) Design the size and spacing of dowel bars at the expansion joints of a cement concrete slab of 25 cm. thick with radius of relative stiffness 80 cm for a design load of 5000 kg. Assume a load capacity of dowel bar system as 40 % of the design wheel load. Joint width is 2.0 cm. Permissible shear and flexural stresses in dowel bar are 1000 and 1400 kg/cm$^2$ respectively and permissible bearing stress in cement concrete is 100 kg/cm$^2$. (8 marks)

(d) How is the spacing of contraction joints determined ? (7 marks)

V. (a) Explain how we can analyse a flexible pavement failure. (8 marks)

(b) Enumerate rigid pavement deficiencies. (7 marks)

*Or*

(c) Briefly explain Benkelman Beam Deflection. (7 marks)

(d) Write a note on the requirements of a good pavement. (8 marks)

(4 × 15 = 60 marks)