

Reg No:.....

Name:

B-TECH DEGREE EXAMINATION, MAY 2013

Eighth Semester

Branch: Civil Engineering

(CE010 804L05) –HIGHWAY AND AIRFIELD PAVEMENTS

ELECTIVE 111(MODEL QUESTION PAPER)

(Regular)

Time: Three Hours

Max. Marks: 100

PART A

(Answer all questions, each question carries 3 marks)

1. Differentiate between flexible and rigid pavements?
2. Explain the equations used in McLeod method of pavement design?
3. State the various elements that induce stress in rigid pavements?
4. Discuss the design considerations for spacing of contraction joints with or without reinforcement?
5. Discuss different methods of pavement evaluation?

PART B

(Answer all questions, each question carries 5 marks)

6. Describe the effects of climatic variations on pavement design?
7. Explain the theory of Burmister to evaluate the stresses in pavements?
8. Explain the terms a) Radius of relative stiffness b) Equivalent radius of resisting section?
9. Discuss critical combination of stress due to wheel load and temperature effects?
10. Explain any one method of measuring skid resistance of pavements?

PART C

(Answer any three questions)

(Each full question carries 12 marks)

11. a) Discuss the importance of gross wheel load and contact pressure in stress distribution pattern in pavement design? (6)
b) Explain the strength characteristics of pavement materials? (6)

Or

12. Explain briefly on Equivalent Single Wheel Load and repetition of loads? (12)

13. The CBR test carried out on subgrade soil gave the following readings

Penetration (mm)	Load (kg)	Penetration (mm)	Load (kg)
0	0	3.0	58
0.5	4	4	70
1	14	5	77.7
1.5	30	7.5	93.2
2.0	41	10	102.5
2.5	50	12.5	110.8

The different pavement materials available near the construction site are as follows

- a) Sandy soil with CBR =8%
- b) Soil kankar mix with CBR =20%
- c) Broken stone and gravel with CBR =90%
- d) Bituminous concrete for surfacing = minimum 5cm thick

The present ADT of commercial vehicle is 1200. The annual rate of growth of traffic is found to be 8%. The pavement construction is to be completed in three years after the last traffic count.

Design the pavement section by CBR method as recommended by IRC, using all the four pavement materials. (12)

Or

14. a) Explain the Group Index method of pavement design? What are the limitations of this method? (6)

b) Design the pavement by GI method for the anticipated traffic volume of over 300 commercial vehicles per day. Given LL= 40%, PL =20% and soil portion passing 0.074mm sieve =60% (6)

15. a) What are the considerations for the design of rigid pavements? (6)

b) Compute the radius of relative stiffness of 15cm thick cement concrete slab from the following data: E of concrete $2 \times 10^5 \text{ kg/cm}^2$, Poisson's ratio of concrete is 0.15, Modulus of subgrade reaction a) 3 kg/cm^3 , b) 7.5 kg/cm^3 (6)

Or

16. Calculate the stress at interior, edge and corner of a CC pavement by Westergaard's equation?

Wheel load=5100kg, E of concrete $2 \times 10^5 \text{ kg/cm}^2$. Thickness of pavement 20cm, Poisson's ratio of concrete is 0.15, Modulus of subgrade reaction 2.5 kg/cm^3 , Radius of contact area=20cm (12)

17. Design the size and spacing of dowel bars at the expansion joints of a CC pavement of thickness 22cm with radius of relative stiffness 85cm for a design wheel load 5000kg. Assume load capacity of dowel system as 40% of design wheel load, joint width 2cm, permissible shear and flexural stress in dowel bar are 1000 and 1400 kg/cm² respectively and permissible bearing stress in CC is 100kg/cm²? (12)

Or

18. Determine the warping stress at interior, edge and corner of a rigid pavement with transverse joints at 10m interval and longitudinal joints at 3.75m interval. Temperature differential condition for 4days is to be 0.6⁰C/cm slab thickness.
Width of slab= 3.75m, Thickness of CC pavement 200mm, Thermal expansion of concrete= 10×10^{-6} / ⁰C. E of concrete 3×10^5 kg/cm², Modulus of subgrade 6.9kg/cm², Radius of loaded area=15cm, Poisson's ratio of concrete is 0.15. (12)

19. Benkelman beam deflection studies were carried out on 20 selected points during winter season on a stretch of pavement using a dual wheel load of 4084 kg and tyre pressure of 5.6 kg/cm². The pavement surface temperature was found to be 30⁰ C. The pavement was resting on a clayey subgrade. The moisture correction factor was found to be 1.2. If the present traffic consists of 2000 commercial vehicles/day, design the thickness of flexible overlay using IRC 81:1997. Assume annual rate of growth of traffic as 7.5%. Rebound deflection values measured are 1.25,1.36, 1.85, 1.75, 1.85, 1.90, 1.75, 1.60, 1.55, 2.10, 1.82, 1.35, 1.45, 1.55, 1.65, 1.75, 1.80, 1.90, 2.10 and 2.05. (12)

Or

20. Explain various types of failures in CC pavement and their causes? (12)