

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER M.TECH DEGREE EXAMINATION (Special), AUGUST 2021**GEOMECHANICS AND STRUCTURES****Course Code: 20CEGST134****Course Name: Analysis and Design of Pavements****Max. Marks: 60****Duration: 3 Hours***IRC 37, IRC 58 and Design charts are permitted***PART A***(Answer all questions. Each question carries 3 marks)*

1. List the desirable properties of bitumen which makes it suitable for constructing pavements.
2. Explain the effect of admixtures on strength gain and workability of cement concrete mixes.
3. State the assumptions and limitations of using ESWL for design of pavements.
4. Comment on the various approaches in flexible pavement design.
5. What are the assumptions made by Westergaard in pavement design?
6. Explain the warping stresses in rigid pavements.
7. State the functions of each type of joints in a concrete pavement.
8. Explain the basic requirements of a joint sealer and justify.

PART B*(Answer one full question from each module, each question carries 6 marks)***MODULE I**

9. Explain any three traffic factors and loading factors incorporated in the design of pavements. (6)

OR

10. Write the salient features of Marshall method for designing bituminous mixes. Discuss the limitations of this method. (6)

MODULE II

11. Explain the common materials used in the category of semi rigid courses. (6)

OR

12. Discuss the scope and method of soil stabilization using soft aggregates. (6)

MODULE III

13. Compare Boussinesq's and Burmister's approaches in flexible pavement design. (6)

OR

14. During a standard axle survey of sample size 9000, the number of load repetitions expected by standard axles of 40KN, 100KN and 150KN is 10000, 1000 and 250. Find the equivalent single axle load using the fatigue cracking as failure criteria. Criteria for fatigue is given as $N_f = 2.21 \times 10^{-4} (\epsilon_t)^{-3.89} E^{0.854}$. Calculate the Vehicle damage factor also. (6)

MODULE IV

15. Design the pavement for construction of a new two-lane carriage way for design life of 15 years using IRC method. The initial traffic at the year of completion is 200CVPD. VDF based on axle load survey is 3 standard axles per CV. Design CBR for subgrade is 5%. Assume suitable growth rate. (6)

OR

16. The plate bearing tests are conducted with a 75cm diameter plate on soil subgrade and over 15cm base course. The pressure yielded at 0.5cm deflection are 0.125 MN/m² and 0.4 MN/m². Design the pavement section for 40KN wheel load with tyre pressure 0.5 MN/m² for allowable deflection of 0.5 cm using Burmister's approach. (6)

MODULE V

17. Calculate the stresses due to load at interior edge and corner region of a cement concrete pavement using the following data. Wheel load 5100kg, Pavement thickness 20 cm and modulus of subgrade reaction 15 kg/cm². Radius of contact area $a = 15$ cm. Use Westergaards stress equation and IRC charts. (6)

OR

18. Explain the terms briefly
(i) Modulus of subgrade reaction (ii) Radius of relative stiffness (iii) Frictional stresses. (6)

MODULE VI

19. Design the length and spacing of tie bars given that pavement thickness is 30 cm and width of road is 7m wide with one longitudinal joint. The unit weight of concrete is 2400 kg/cm², the coefficient of friction is 1.5, allowable working tensile stress in steel is 1750 kg/cm² and bond stress of deformed bar is 24.6 kg/cm² (6)

OR

20. What is the purpose of Dowel bars? Explain the design procedure in deciding the spacing of the Dowel bars. (6)
