APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

08 PALAKKAD CLUSTER

QP. code :TC1181 **(pages: 1-3)** **Name:**

Reg No:

FIRST SEMESTER M.TECH. DEGREE EXAMINATION DEC 2018

(Civil Engineering – Transportation Engineering)

Subject id:08CE6203 **PAVEMENT ANALYSIS AND DESIGN**

Time:3 hours **Max.marks: 60**

Answer all six questions. Part 'a' of each question is compulsory.

Answer either part 'b' or part 'c' of each question

(Charts and tables can be used wherever necessary.)

Q.no.	Module 1	Marks
1.a	Why is it necessary to determine flakiness and elongation indices of an aggregate sample?	3
	Answer b or c	
b	Explain Marshal Stability test method of mix design for bituminous mixes. Plot the sample graphs to determine optimum binder content. List out the standard specifications.	6
c	Describe any two tests on aggregates with the corresponding standard specifications.	6

Q.no.	Module 2	Marks
2.a	Differentiate between highway and airport pavements.	3
	Answer b or c	
b	Plot the sample graphs to determine optimum binder content. Brief about Asphalt Institute method and NAPA method of determination of OBC.	6
c	Calculate the design volume for a particular highway section if the design period is 20 years. The current AADT is 5000 vehicle/ day, the average truck factor is 1.9, the directional distribution factor is 0.6, the lane distribution factor is 0.8 and the traffic is expected to grow at 5 % per annum for the first 10 years, 6% per annum for the next 7 years and 8% per annum for the rest of the design period.	6

Q.no.	Module 3	Marks
3.a	Compare and contrast one layer theory and three layer theory.	3
	Answer b or c	
b	Determine the thickness of a flexible pavement by Burmister's two layer theory for a wheel load of 40 KN and a tyre pressure of 0.5 MN/ m^2. The modulus of elasticity of the pavement material is 120 MN/ m^2 and the sub grade is 12 MN/m^2. The value of Fw for E1/E2 of 10 can be taken as under:	6

Thickness of the top layer	Fw
0.5a	0.8
1a	0.5
2a	0.3

The allowable deflection is 0.5cm.

c	Given the three-layer system with a = 4 .8 in. (122 mm), q = 120 psi (82kPa), $h1$ = 6 in. (152 mm), h2 = 6 in. (203 mm), E1 = 400,000 psi (2.8 GPa), $E2$ = 20,000 psi (138 MPa), and $E3$ = 10,000 psi (69 MPa), determine all the stresses and strains at the tw o interfaces on the axis of symmetry .	6

Q.no.	Module 4	Marks
4.a	Briefly explain the different types of flexible pavement design methods.	3
	Answer b or c	
b	Design the pavement for construction of a new bypass with the following data: Two lane carriage way; Initial traffic in the year of completion of construction = 400 CVPD (sum of both directions); Traffic growth rate = 7.5 %; Design life = 15 years Vehicle damage factor based on axle load survey = 2.5 standard axle per commercial vehicle; Design CBR of subgrade soil = 4%.	6
C	Explain IRC method of flexible pavement design as per IRC 37:2012.	6

Q.no.	Module 5	Marks
5.a	Compare the mechanism used in rigid and flexible pavements for handling stresses due to temperature.	4
	Answer b or c	
b	Explain in detail the PCA method of rigid pavement design	8
c	Design a suitable concrete pavement (4.5x 3.5cm) as per IRC, situated at Kanpur, for design wheel load of 4100 kg and tyre pressure of 7 kg/cm2. The CBR value of the sub grade soil is found to be 4. 5%. The forecasted traffic intensity at the end of design life is 1000 CV/ day. Assume other parameters wherever necessary.	8

Q.no.	Module 6	Marks
6.a	Discuss the similarities and differences in the process of designing jointed plain concrete pavements and jointed reinforced concrete pavements.	4
	Answer b or c	
b	Explain the need and requirements of joints in cement concrete pavements. What are the various types of joints?	8
c		8
	(i) List out the steps in the procedure for the design of tie bars in the cement concrete pavements	
	(ii) Design a tie bar system for a cement concrete pavement.	
	Slab thickness is 20mm, slab width is 3.35m	
	No.of lanes to be tied is 2, and coefficient of friction between slab and subgrade is 1.5 , weight of slab is 80kg/m2, allowable working stress in steel is 1400kg/cm2. Maximum permissible bond stress in plain bars is 17.5 kg/cm2 and deformed bars is 24 kg/cm2.	