Reg 1	No.: Name:				
S	<b>APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY</b> EVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 20	19			
	Course Code: CE467 Course Name: HIGHWAY PAVEMENT DESIGN				
Max. Marks: 100 Duration: 3 Ho					
	(Use of IRC 37-2012, IRC 58-2002/2011 and design charts permitted) PART A				
	Answer any two full questions, each carries 15 marks.	Marks			
1 a)	How is Subgrade strength assessed for design of flexible pavements? Briefly explain the test procedure.	(5)			
b	) Why is it necessary to consider Lateral Distribution Factor (LDF) in the estimation of traffic loads in pavement design? Substantiate the answer with neat sketches	(5)			
c	<ul> <li>Plot the trend of following in a Marshall mix design a) Voids in Mineral aggregate v/s Bitumen content; b) Voids filled with bitumen v/s Bitumen content,</li> <li>c) Air voids v/s Bitumen content; d) Marshall Stability v/s Bitumen content;</li> <li>e) Marshall Elow v/s Bitumen content</li> </ul>	(5)			
2 a)	) Explain in detail the need and mix design procedure in mechanical soil stabilization.	(10)			
b	) Explain the concept of Equivalent Single Wheel Load (ESWL). How is ESWL determined using Equal Vertical Stress criterion	(5)			
3 a)	A circular load having radius of 152 mm and uniform pressure 0.56 MPa is applied on two layer system. The subgrade has elastic modulus of 35MPa and can support a maximum vertical stress of 0.056 MPa. If bituminous layer has elastic modulus of 3500 MPa, what is the required thickness of a full depth pavement?	(8)			
b	) Explain how climatic variation affects pavement design and performance.	(7)			
	PART B				
	Answer any two full questions, each carries 15 marks.				
4 a)	A plate bearing test using a 75cm plate was made on a subgrade as well as on 26cm of gravel base course. Unit load required to cause settlement of 0.5cm was $0.67$ kg/cm <sup>2</sup> and $2.67$ kg/cm <sup>2</sup> respectively. Determine the required thickness of	(10)			
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base course to sustain 25000kg, 6.67 kg/cm<sup>2</sup> pressure and maintain a deflection of 0.5cm.

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	b)	Discuss Mc Leod method of pavement design in detail.	(5)
5	a)	Explain briefly Winkler foundation used in the design of Concrete pavements.	(5)
	b)	List the various Empirical methods of Pavement Design? What are the	(3)
		drawbacks?	
	c)	Discuss the nature of load and temperature induced stresses in a concrete slab	(7)
		during day time and night time. Which condition is considered to be critical in pavement design?	
6	a)	Describe briefly the thermal stresses developed in Concrete slab due to seasonal	(6)
	,	variation of temperature	
	b)	Briefly explain flexible pavement design method using IRC 37: 2012	(9)
		PART C	
		Answer any two full questions, each carries 20 marks.	
7	a)	Explain the principle and procedure of Benkelman Beam test.	(10)
	b)	IRC 58: 2002, for the design of JPCP pavements without tied shoulder, considers	(5)
		wheel load stresses to be critical when the tire imprint touches the longitudinal	
		edge. Why?	
	c	How does load transfer occurs across a contraction joint in Jointed Plain Cement	(5)
		Concrete Pavements?	
8	a)	Discuss briefly the quality control tests that a Highway Engineer needs to ensure	(10)
		during procurement of materials and immediately after construction of flexible	
		pavements	
	b)	Briefly outline IRC procedure for determining the thickness of cement concrete	(10)
		pavement	
9	a)	A cement concrete pavement has a thickness of 18 cm and has two lanes of 7.2m	(8)
		with a longitudinal joint along the control Design the dimensions and marine of	

- with a longitudinal joint along the centre. Design the dimensions and spacing of the tie bar. Allowable working stress in tension =  $1400 \text{kg/cm}^2$ , Unit weight of concrete =  $2400 \text{kg/m}^3$ , Allowable bond stress in deformed bars in concrete= $24.6 \text{kg/cm}^2$  and coefficient of friction = 1.5
  - b) Distinguish between Dowel and Tie bars used in JPCP. (6)
  - c) Discuss in detail any one method each of Functional and Structural Performance (6) assessment of Pavements

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