

GUJARAT TECHNOLOGICAL UNIVERSITY**M.E Sem-II Examination July 2010****Subject code: 721906****Subject Name: Pavement Design and Analysis****Date: 08 /07 /2010****Time: 11.00am – 1.30pm****Total Marks: 60****Instructions:**

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**

Q.1 Explain, with sketches major types of pavement structures showing various layers (courses) along with load-transmission pattern, fuel economy, life cycle cost and justification in rural/urban areas and different climatic conditions. **12**

Q.2 (a) Enlist methods for flexible payment design and rigid pavement design. Explain in details CBR method of pavement design as per IRC-37-2001. **06**

(b) Explain equivalent axle load factor, design life, gross vehicle weight, million standard axle(MSA). **06**

OR

(b) Explain Bermister method of pavement design. Design the thickness of a flexible pavement by Bermister's 2 layer analysis for a wheel load of 40 kN and tyre pressure of 0.5 MN/m^2 . Modulus of Elasticity of pavement material is 150 MN/m^2 and that of subgrade is 30 MN/m^2 . The value of F_w , the displacement factor is 0.43. **06**

Q.3 (a) Explain pavement maintenance and rehabilitation. Discuss various types of overlays. **06**

(b) Enumerate the structural components of flexible pavement and briefly explain the function of each component. **06**

OR

Q.3 (a) What is the significance of sub-base course and base course in flexible pavement structure? **06**

(b) What is the function of leveling course and binder course for flexible pavement structure? **06**

Q.4 (a) What is the significance of surface course for flexible pavement structure? **06**

(b) Explain the significance of tack coat, prime coat and seal coat for flexible pavement structure. **06**

OR

Q.4 (a) What is full depth asphalt pavement? Explain its suitability and its advantages. **06**

(b) Draw a typical cross-section of a rigid pavement and justify the use of base course for rigid pavement structure. **06**

Q.5 (a) Explain, with sketches different types of concrete pavements and their suitability with respect to traffic and climatic conditions. **06**

- (b) Calculate the total expected number of repetition of single axles for the design of rigid pavement from following data : **06**
- Design life = 20 years
 Total 2 Way Traffic at the end of construction period = 3000 CVD
 Annual rate of traffic increase = $r = 7.5\%$
 Axle load spectrum :

Axle Load Class(Tones)	19-21	17-19	15-17	13-15	11-13	9-11	<9	Total
% of Axle Load	0.6	1.5	4.8	10.8	22	23.3	30	93

OR

- Q.5** Explain the design consideration for spacing of (i) contraction joints (with and without reinforcement) (ii) expansion joints in CC slab of rigid pavement. **12**
- Calculate the spacing between contraction joints for 3.5 m slab width having a thickness of 20 cm for (i) plain concrete slab and (ii) RCC slab (total reinforcement of 6 kg/m^2 equally distributed in both directions). The allowable tensile stress values in cement concrete and steel are 0.8 and 600 kg/cm^2 respectively, coefficient of friction f is 1.5
- Calculate the spacing of expansion joint from the following data:
 Maximum joint width = 2 cm
 Temperature at the time of laying concrete = 20°C
 Maximum slab temperature (expected) = 55°C
 Coefficient to thermal expansion = $10^{-5} / ^\circ \text{C}$
 Sketch Plan and section of contraction and expansion joints.
