Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – WINTER • 2013

Subject code: 1721906 Date: 02-01-2014

Subject Name: Pavement Design and Analysis

Time: 10.30 am – 01.00 pm Total Marks: 70

Instructions:

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

Q.1 **(a)** Draw typical pavement cross sections for FP and RP annotating all the component part of pavement and write functions of each component **07**

(b) Differentiate between Flexible and Rigid pavement. **03**

What is ESWL? Explain the concept in the determination of the equivalent load. **04**

Q.2 **(a)** Differentiate between highway and airport pavement. **07**

Determine vertical stress and shear stress at a point 4m below point load of 4T acting at level ground surface. What will be the values of vertical pressure and shear stress at a point 2m, horizontally away from the axis of loading but at the same depth?

(b) Explain the Vehicle Damage Factor. **07**

The following data were obtained from axle load survey. Determine VDF based on a standard axle load of 80KN.

Axle load (KN)	30-40	40-50	60-70	70-80	80-90	90-100
frequency	5.76	6.45	7.22	6.96	9.63	12.04
Axle load (KN)	90-100	100-110	110-120	120-130	130-140	140-150
frequency	14.02	10.49	8.43	7.82	5.25	5.93

OR

(b) Write a note on any two. **07**

i. Tyre pressure and contact pressure
ii. Lane Distribution Factor
iii. Wheel loads

Q.3 **(a)** Explain relative stiffness of slab to sub grade. **07**

Define radius of relative stiffness. Compute the radius of relative stiffness of 18cm thick cement concrete slab with E=2,10,000 kg/cm2; μ=0.13 and sub-grade K=3.0 kg/cm^3 and 7.5 kg/cm^3

(b) Explain with appropriate formulae the stresses induced in cement concrete pavement at interior, edge and corner. **07**

OR

Q.3 **(a)** Calculate the stresses at interior, edge and corner regions of a CC pavement using **07**

Weterguaard's stress equations use following data:

Wheel load, P=5100 kg

E= 3.0 X10^5 kg/cm^2

Pavement thickness, h=20cm

Poisson's ratio of concrete, μ=0.15

Modulus of subgrade reaction k=6.0 kg/cm^3

Radius of contact area, a=15cm

(b) Explain pavement evaluation for riding quality and structural capacity **07**

Q.4 **(a)** Write note: **07**

i. Falling weight deflectometer

ii. Benkelman beam method for pavement

(b) Write note: **07**

i. Continuously Reinforced Concrete Pavement

ii. Tie bars and Dowel bars

OR

Q.4 **(a)** Explain the significance of tyre pressure on pavement performance and discuss contact pressure and tyre pressure. **07**

(b) Explain factors considered in pavement overlay design. **07**

Q.5 **(a)** A structural evaluation of flexible pavement is carried out by Benkelman beam. Find out characteristic deflection using following data. **07**

- Nos. of traffic lane= 1
- Pavement temp= 39˚ c
- Moisture content= 10 %
- Annual rainfall=1200mm
- Assume moisture correction factor=1.12
- Type of soil=sandy with gravel trace
- Deflection reading of Benkelman beam at interval of 50m:

Sr.no	1	2	3	4	5	6	7	8	9	10
Rebound deflection	0.42	0.53	0.91	0.95	0.08	0.78	0.98	0.72	0.40	0.47

(b) Explain with sketches, types of joints in rigid pavement **07**

OR

Q.5 **(a)** Explain critical combination of stresses in rigid pavement **07**

(b) Write note on: **07**

i. Overlay Design

ii. Ultra Thin White Topping

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