GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER II (NEW) - • EXAMINATION - SUMMER 2016

Subject Code: 2721302

Date: 25/05/2016

Subject Name: Pavement Design Construction and Evaluation

Time: 10:30 am to 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 Explain in detail various factors affecting pavement design. 07 (a) What are the functions of pavements? Give detailed comparison between **(b)** 07 Flexible and Rigid pavements. **O.2** Explain with sketches Burmister's layered theory. 07 (a) Briefly explain: Tyre pressure, contact pressure, rigidity factor, ESWL, EWLF. 07 **(b)** OR How the design of Runway pavement differs with design of Highway pavement? 07 **(b)** Briefly discuss LCN system of runway pavement design. **Q.3** Explain with sketch laboratory procedure of CBR test. 07 **(a) (b)** Design a suitable bituminous pavement section for a two-lane road with a Single 07 carriageway. The traffic expected is 500 commercial vehicles per day in both directions with average vehicle damage factor of 1.8. Design subgrade CBR is 3 % and the assumed design life of the pavement is 10 years. Take lane distribution factor 0.75. Use Guidelines of IRC 37-2001 (See Fig.1 and Plate 1). OR **Q.3** Explain with sketch laboratory procedure of Marshall stability test for 07 **(a)** bituminous mix design. Calculate the stresses at interior, edge and corner region of cement concrete 07 **(b)** pavement using Westergaard's stress equations. Take wheel load = 5200 kg, Ec = 3 x 10⁵ kg/cm², Pavement thickness = 20 cm, μ = 0.15, Modulus of subgrade reaction $K = 7 \text{ kg/cm}^3$, Radius of contact area = 15cm. Compare Benkelman Beam Deflection test with Falling Weight Deflection test. **Q.4** 06 (a) **(b)** Design the Tie bars for the CC pavement having following data: 08 Slab thickness = 34 cm, Lane width = 3.5m, Coefficient of friction = 1.5, Density of concrete = 2400 kg/m^3 , Allowable tensile stress in plain bars = 1250 kg/cm^2 , Allowable bond stress = 17.5 kg/cm², Diameter of tie bar = 12mm. Use Guidelines of IRC 58-2002. OR Which special precautions will be required for road construction in (i) Desert, **Q.4 (a)** 06 and (ii) Hilly area? Design the Dowel bars for the CC pavement having following data: 08 **(b)** Slab thickness = 34 cm, Lane width = 3.5m, Design wheel load=8200kg (dual wheel load), Percent of load transfer=40, Joint width=2 cm, $Ec = 3 \times 10^5$ kg/cm², $\mu = 0.15$, Modulus of subgrade reaction K = 8 kg/cm³, f_{ck}=400kg/cm², Modulus of dowel/concrete interaction=41500 kg/cm3, Use Guidelines of IRC 58-2002.
 - Q.5 Explain with sketch design concept of surface drainage system on highway. 07 (a) 07
 - Discuss functional evaluation and structural evaluation of highway. **(b)**

OR

- Describe 'PSI' and 'PSR'. Discuss their importance and evaluation procedure. Q.5 **(a)**
 - Explain with sketches: (i) Rutting failure in flexible pavement, and (ii) Mud 07 **(b)** pumping in rigid pavement.



IRC:37-2001

PAVEMENT DESIGN CATALOGUE PLATE 1 – RECOMMENDED DESIGNS FOR TRAFFIC RANGE 1-10 msa

CBR 3%								
Cumulative	Total	PAVEMENT COMPOSITION						
Traffic	Pavement	Bitumin	ous Surfacing	Granular	Granular			
(msa)	Thickness	Wearing	Binder	Base	Sub-base			
	(mm)	Course	Course	(mm)	(mm)			
		(mm)	(mm)					
1	550	20 PC		225	435			
2	610	20 PC	50 BM	225	335			
3	645	20 PC	60 BM	250	335			
5	690	25 SDBC	60 DBM	250	335			
10	760	40 BC	90 DBM	250	380			





CBR 4%								
Cumulative	Total	PAVEMENT COMPOSITION						
Traffic	Pavement	Bitumin	ous Surfacing	Granular	Granular			
(msa)	Thickness	Wearing	Binder	Base	Sub-base			
	(mm)	Course	Course	(mm)	(mm)			
		(mm)	(mm)					
· 1	480	20 PC		225	255			
2	540	20 PC	50 BM	225	265			
3	580	20 PC ·	50 BM	250	280			
5	620	25 SDBC	60 DBM	250	285			
10	700	40 BC	80 DBM	250	330			



Plate 1

07