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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- December-2018

B.Tech V Semester

COURSE CODE: 10B11CE511 MAX. MARKS:35

COURSE NAME: Highway Engineering

COURSE CREDITS: 04 MAX. TIME: Two Hours

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Assume any other missed data accordingly.*

Q1. Determine the fatigue life consumed in rigid pavement assuming a trial thickness of **28 cm** for the following data-(Flexural strength of cement concrete=45 kg/cm^2) **(4)**

Load in tones (single axle)	Expected Repetitions	Stress kg/cm^2 from charts (For axle load*1.2)	Load in tones (tandem axle)	Expected Repetitions	Stress kg/cm^2 from charts (For axle load*1.2)
20	62354	32.15	36	36524	27.22
18	154286	29.85	32	37845	24.57
16	521458	26.31	28	82541	21.85
14	1325487	24.17	24	201457	18.89
12	2736524	21.43	20	185462	16.23
10	3185412	18.88	16	59278	13.46

Q2. The design thickness of a CC pavement is 28 cm considering a design axle load (98th percentile load) of 14,000 kg on single axle and M-40 concrete with characteristic compressive strength of 400 kg/cm^2. If the elastic modulus of dowel bar steel is 2X10^6 kg/cm^2, modulus of dowel concrete interaction is 41,500 kg/cm^3, Elastic modulus of concrete is 3X10^5 kg/cm^2, Modulus of subgrade reaction is 8 kg/cm^3 and joint width is 2.0 cm, design the dowel bars. Given- μ=0.15. **(4)**

Q3. BBD test was carried out on a stretch of four lane single carriageway flexible pavement of State Highway. Design the overlay from the following data- temperature during the test was 27.2°C, correction for subgrade moisture content is 1.7, initial commercial traffic at the end of construction is 2330 CVPD (in both direction), annual growth rate of vehicles is 7.5%, design life is 5 yrs, VDF is 2.8 **(4)**

D_o	99	99	99	99	99	99	99	99	99	99	99	99
D_i	57	56	58	60	59	57	53	61	56	54	55	59
D_f	55	52	56	59	54	55	50	57	54	52	52	56

Q4. At a right angled intersection of two roads, Road A has eight lanes with a total width of 30m and Road B has four lanes with a total width of 15m. The volume of traffic approaching the intersection during design hour are 2452 and 1672 PCU/hour on approach Road A; the traffic is 632 and 448 PCU/hour on approach Road B. Design the signal timings as per IRC guidelines, assuming the necessary data. **(4)**

Q5. The entry and exit width of a rotary intersection are 9m and 11m respectively. The width of approaches at the intersection is 15m. The traffic from the four approaches traversing the intersection is given below. Determine the capacity of rotary. **(4)**

Approach	Left Turn	Straight	Right Turn
North	521	705	389
South	458	370	410
West	485	512	398
East	371	507	983

Q6. The traffic studies and axle load distribution studies carried out during project preparation indicated that there are 5600 commercial vehicles per day with rear axle loads in the range of 2500 to 3500 kg and growth rate of 6.5% p.a. The road pavement is expected to be constructed in a period of 3 years after this study and the flexible pavement structure is to be designed for a life of 15 years. Determine the value of VDF and CSA for design. **(4)**

Q7. Explain the relationship with neat graphs between- (i) traffic volume & traffic density, (ii) traffic speed & traffic volume (iii) traffic speed & traffic density **(3)**

Q8. A state highway through a rolling terrain has a horizontal curve of radius equal to ruling minimum radius. Design the following, assuming the necessary data- Ruling minimum radius, superelevation, extra widening, length of transition curve. **(4)**

Q9. Explain in detail-

(i) CBR Test Method

(ii) Marshall Stability Test **(4)**