

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), Nov. 2017

B. Tech in Civil Engineering, Semester V

Roll No.....

CE 511: Transportation Engineering-I

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A	Objective type multiple choice questions (10 questions @ 1 mark)	10
i.	The maximum safe speed on roads, depends on the (a) type of the highway (b) type of road surface (c) Type of curves (d) all the above.	
ii.	The wall constructed for the stability of an excavated portion of a road on the hill side, is known as (a) retaining wall (b) breast wall (c) parapet wall (d) all the above	
iii.	In India the modes of transportation, in the order of their importance, are (a) air transport, shipping, roads, railways (b) shipping, roads, railways, air transport, (c) Shipping, railways, roads, air transport. (d) railways, roads, shipping, air transport	
iv.	The load value on standard crushed stone for 2.5mm penetration in CBR test is a) 1370 kg, b) 1730 kg, c) 2055 kg d) 1500 kg	
v.	In the Los Angeles abrasion test on aggregates, if the speed of the drum is increased to 50 rpm, then the abrasion value will a) increase , b) decrease , c) remain unchanged d) be unpredictable	
vi	Design of flexible pavements is based on (a) mathematical analysis (b) empirical formulae (c) a compromise of pure theory and pure empirical formula (d) none of these	
Vii	If the stopping distance is 60 meters, then the minimum stopping sight distance for two lane, two way traffic is a) 30 m , b) 60 m c) 120 m d) 180 m	

viii	Select the correct statement. (a) Nagpur road plan formula take into account the towns with very large population. (b) Nagpur road plan has a target road length of 32 km per 100 square km. (c) Second 20-year plan has provided 1600 km of expressways out of the proposed National highway (d) Second 20-year plan allowed deduction of length of railway track in the area while calculating the length of roads.	
ix	Reaction time of a driver (a) increases with increase in speed (b) decreases with increase in speed (c) is same for all speeds (d) none of these	
x	The sequence of four stages of survey in a highway alignment is (a) reconnaissance, map study, preliminary survey and detailed survey (b) map study, preliminary survey, reconnaissance and detailed survey (c) map study, reconnaissance, preliminary survey and detailed survey (d) preliminary survey, map study, reconnaissance and detailed survey	

Q.2	Short answer type questions (4 questions @ 2.5 marks)	10
i	While aligning a hill road with a ruling gradient of 6 percent, a horizontal curve of radius 60 m is encountered. Find the grade compensation and the compensated gradient at the curve.	
ii	Explain with sketches the star and grid pattern.	
iii	Comparison between Macadam & Telford method of road construction.	
iv	In a district road where the rainfall is heavy major district road of WBM Pavement, 3.8m wide and a state highway of bituminous concrete pavement, 7.0 m wide are to be constructed. What should be the height of crown with respect to the edge in these two cases	

Q.3A	What are the significant recommendation of Jayakar committee report? Briefly outline the classification based on the location and function as suggested in the Nagpur Road plan.	05
Q.3B	Derive the expression for calculating the overtaking sight distance on a highway.	05

Q.4A	Explain total reaction time of driver and the factor on which it depend. Explain "PIEV" theory and the importance.	05
Q.4B	The design speed of a road is 65 kmph, the friction coefficient is 0.36 and reaction time of driver is 2.5 sec. Calculate the value of (a) Head light sight distance and (b) intermediate sight distance required for road.	05

Q.5A	What are the objects of highway geometric design and explain sight distance and factor causing restrictions to sight distance.	05
Q.5B	The speed of overtaking and overtaken vehicles are 70 and 40 kmph,	05

	respectively on a two way traffic road. The average acceleration during overtaking may be assumed as 0.99 m/sec^2. (a) Calculate safe overtaking sight distance (b) What is minimum length of overtaking zone? (c) Draw a neat- sketch of the overtaking zone and show the position of the sign post.	
Q.6A	Explain CBR and the test procedure in the laboratory. What are the applications and limitations of shear, bearing and penetration tests?	05
Q.6B	Draw a sketch of flexible pavements cross section and show the components parts. Enumerate the functions and importance of each component of the pavement.	05
OR		
Q.6B	Explain 'Flexible and Rigid' pavements and bring out points of difference.	05
Q.7A	Write short notes on : (a) Krebs (b) Road margins (c) Width of pavement or Carriageway (d) Cross slope or camber (e) pavement unevenness	05
Q.7B	Determine the warping stress at interior edge and corner of a 25 cm thick cement concrete pavement with transverse points at 5m interval and longitudinal Joints at 3.6 m intervals. The modules of subgrade reaction k is 6.9 kg/cm^3. Assume Max. temperature differential during day to be 0.6°C per cm slab Thickness (for warping stress at interior and edge) and max temp. Differential of 0.4°C per slab thickness during night (for warping stress at the corner). Additional data given. ($e = 10 \times 10^{-6} \text{ per}^\circ\text{C}$, $E = 3 \times 10^5 \text{ kg/cm}^2$ $\mu = 0.15, C_x = 0.88, C_y = 0.54$)	05
OR		
Q.7B	Write note on; a) OSD, b) SSD, c) SD, d) ISD and derive the formula for the same?	05
Q.8	Explain super elevation. What are the factor on which the design of Superelvation depends? Design the Superelvation required at a horizontal curve of radius 300m for speed of 60kmph. Assume suitable data.	10
Q.9A	Using the data given below, calculate the wheel load stresses at (a)interior (b)edge and (c)corner region of a cement concrete pavement using Westergaard's stress equation. Also determine the probable location where the crack is likely to develop due to corner loading.	10

	Wheel load = 5200kg Modulus of elasticity of cement concrete, $E = 3.0 \times 10^5 \text{ Kg/cm}^2$ Pavement thickness, $h = 18 \text{ cm}$ Poisson ratio of concrete $\mu = 0.15$ Modulus of subgrade reaction, $K = 6.0 \text{ Kg/cm}^3$	
Q.9B	Explain the desirable properties of aggregates to be used in different type of pavement construction? List different tests on road aggregates and mention their advantage and limitations.	10
	OR	
Q.9B	What are the different types of bituminous materials used in road construction? Under what circumstance each of these materials is preferred and what are the various tests carried out on bitumen? Briefly mention the principal and use of each test.	10