

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Special Exam) JULY 2019
B. Tech. in Civil Engineering, Semester VI

Roll No.....

CE 511: Transportation Engineering

Time: 3 hours

Max. Marks: 60

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.
4. In order to solve complex mathematical forms, Casio fx-991 MS or fx-991 ES or fx-991 ES Plus shall be permitted, however **programmable calculators** are strictly not entertained.

Q.1A	Short answer type questions (Attempt any 2 questions @ 5 marks each) Comment, validate and support your answer	10
i.	Determine the minimum non-passing sight distance that should be provided for a vehicle coming down a 6 per cent gradient, Using the following data: 1. Design speed, $V = 56 \text{ kmph}$ 2. Reaction time of the driver = 2 seconds 3. Coefficient of friction between tyre and Road surface = 0.5	
ii.	'Often it is said that threat to pavement is water and only due to water'. Comment.	
iii.	If for some reason the required minimum OSD cannot be provided on a highway for the design speed what precautions should be taken alternatively to minimize accident hazard?	
Q.2A	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.2B	A driver travelling at the speed limit of 50 kmph was cited for crossing an intersection. He claimed that the duration of the amber display was improper and consequently a dilemma zone existed at that location. Using the following data, determine whether the driver's claim was correct. (i) amber duration = 4.5 sec (ii) perception reaction time = 1.5sec (iii) Comfortable deceleration = 3 m/sec^2 (iv) car length = 4.6 m (v) Intersection Width = 15m	05
Q.3A	A driver travelling at the speed limit of 50 kmph was cited for crossing an intersection. He claimed that the duration of the amber display was improper and consequently a dilemma zone existed at that location. Using the following data, determine whether the driver's claim was correct. (i) amber duration = 4.5 sec (ii) perception reaction time = 1.5sec	05

	(iii) Comfortable deceleration = 3 m/sec^2 (iv) car length = 4.6 m (v) Intersection Width = 15m	
Q.3B	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. 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, $K = 6.0 \text{ Kg/cm}^3$	05
OR		
Q.3B	On a two way traffic road speed of overtaking and overtaken vehicle are 65 and 45 kmph respectively. If the average acceleration of overtaking vehicle is 0.92 m/s^2 . determine (i) safe overtaking sight distance indicating the details of overtaken operation by sketch, and (ii) The minimum length of overtaking zone and show the details of the overtaking zone by neat sketch.	05
Q.4	An express way of four lane divided passing through a flat terrain has a horizontal curve of radius equal to ruling minimum radius. If the design speed is 120 kmph, Calculate the following elements of the curve : (i) Ruling minimum radius (ii) Super elevation (iii) Extra Widening and, (iv) Length of transition curve Suggest the best suitable shape of the transition curve.	10
Q.5	A valley curve of a state highway is formed by a descending gradient of 1 in 20 meeting and ascending gradient of 1 in 30. Design the length of a valley curve to fulfill both comfort condition and headlight sight distance requirement for a design speed of 80 kmph. Assume allowable rate of change of centrifugal acceleration $C = 0.60 \text{ m/sec}^2$. Suggest the best suitable shape of the valley curve. Consider reaction time $t = 2.5 \text{ sec}$ and coefficient of longitudinal friction $f = 0.35$.	10
Q.6	Determine the warping stress at interior edge and corner of a 25 cm thick cement concrete pavement with transverse joints at 5m interval and longitudinal joints at 3.6 m intervals. The modulus 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. $(\epsilon = 10 \times 10^{-6} \text{ per } ^\circ\text{C})$, $E = 3 \times 10^5 \text{ kg/cm}^2$ $\mu = 0.15$,	10

$C_x = 0.88,$
 $C_y = 0.54)$

OR

Q.6

Calculate the stresses at interior , edge and corner regions of a cement concrete pavement using Westergaard's stress equations , using the following data:

10

(i) Wheel load, $P = 4100$ kg

(ii) Modules of elasticity of cement concrete $E = 3.3 \times 10^6$ Kg/cm²

(iii) Pavement thickness , $h = 18$ cm

(iv)Poisson's ratio of concrete , $\mu = 0.15$

(v) Modules of subgrade reaction, $k = 25$ Kg/cm³

(vi)Radius of contact area, $a = 12$ cm.

