Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Sixth semester B.Tech degree examinations (S), September 2020

Course Code: CE308
Course Name: TRANSPORTATION ENGINEERING – I

Max. Marks: 100   Duration: 3 Hours

Codes and charts not permitted

PART A
Answer any two full questions, each carries 15 marks.   Marks

1 a) Explain with sketches the various factors controlling the alignment of roads. Discuss the special care to be taken while aligning hill roads.   (10)

   b) What is the importance of highway geometric design? List the various geometric elements to be considered in highway design.   (5)

2 a) Find out the length of transition curve passing through plain terrain for a two-lane pavement with an extra widening on a horizontal curve of radius 200m. The design speed=60km/hr, Width of pavement on straight stretches is 7.0m and super elevation provided is 0.07. Assume that the pavement is rotated about centre line at the rate of 1 in 100.   (10)

   b) Derive an expression for finding the stopping sight distance at level and at grades.   (5)

3 a) A car travelling at 60km/hr is overtaking another car moving at 40 km/hr on a two-lane undivided highway. Assume the acceleration of overtaking car as 3.6km/hr/sec, and reaction time 2sec.Calculate (i) Overtaking sight distance (ii) Sketch the overtaking zone and show the position of signpost.   (10)

   b) Draw the typical cross sections of the following indicating the width of pavement, roadway and land (i) National highway in embankment in rural area (ii) Divided highway in urban area.   (5)

PART B
Answer any two full questions, each carries 15 marks.

4 a) The soil subgrade sample was obtained from the project site and the CBR tests (10) was conducted at field density gave the following readings. Loads at 2.5mm and 5mm penetration are 55kg and 78kg. Find the total thickness of the pavement by CBR method as recommended by IRC for commercial vehicles 1500 per day, with 7% growth rate. The pavement construction is to be completed in three years after last traffic count. If the materials in different layers are compacted soil with 7% CBR, poor graded gravel with 20% CBR and well graded gravel with 95% CBR, find thickness of each layer and sketch the pavement section. Assume thickness of bituminous layer as 50mm. **(CBR Design Chart provided)**

   b) Explain the desirable properties of aggregates to be used in different types of (5) pavement construction.

5 a) With sketches explain different types of failures in flexible pavements. Also (10) discuss their causes

   b) Explain the vehicular characteristics which affects the traffic performance. (5)

6 a) What are the various factors to be considered in pavement design? Discuss the (10) significance of each.

   b) Explain how spot speed data are presented and the results used in traffic (5) engineering.

PART C
Answer any two full questions, each carries 20 marks.

7 a) What is wind rose diagram? Explain wind rose diagram and how it is being used (8) for determination of runway orientation.

   b) The length of a runway under standard conditions is 2400m. The site for an (12) airport is above 520m above mean sea level. The airport reference temperature is 32^0C. Following data refers to the proposed longitudinal section of runway. Determine the corrected length of runway.

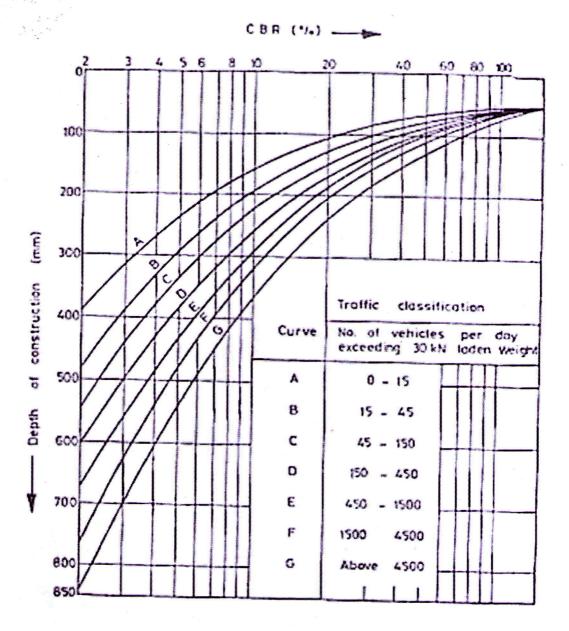| End to end of runway (m)	Grade (%)
0 to 400	+1
400 to 800	+0.5
800 to 1600	-1.0
1600 to 2400	-0.4

8 a) With neat sketches explain the basic patterns of runway configuration (10)

   b) Explain various types of road markings commonly used with the uses of each (10)
      markings

9 a) List the different characteristics of aircrafts. How do they influence the planning (10)
      of airports?

   b) A fixed time 2-phase signal is to be provided at an intersection having four (10)
      arms. The design hour traffic flow and saturation flow are

	North	South	East	West
Design hour flow (pcu/hr)	500	500	350	250
Saturation flow (pcu/hr)	1500	1200	1200	1250

Calculate the optimum cycle length based on Webster's equation and find the corresponding green times. Total loss per phase is 4 sec and yellow interval is 2 sec. Sketch the timing diagrams for each phase.

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CBR Design Chart

CBR (%) ⟶

Curve	Traffic classification No. of vehicles per day exceeding 30 kN laden weight
A	0 - 15
B	15 - 45
C	45 - 150
D	150 - 450
E	450 - 1500
F	1500 - 4500
G	Above 4500