Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fourth Semester B.Tech Degree Examination July 2021 (2019 Scheme)

Course Code: CET206
Course Name: TRANSPORTATION ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks) Marks

1		Draw the section of a two lane National Highway on embankment.	3
2		List out the necessity and requirements of transition curve at horizontal curves. How the length of transition curve is determined?	3
3		What is meant by aggregate crushing value? How is it estimated?	3
4		Distinguish between softening point and fire point of bitumen.	3
5		Define basic capacity of highway? How capacity of highway is estimated?	3
6		What do you mean by signal coordination? Explain systems of signal coordination	3
7		Explain coning of wheels.	3
8		Draw neat sketches of different shapes of tunnels and their suitability for railways.	3
9		Compare runway and taxiway.	3
10		What are the factors to be considered in the design of apron and hanger	3

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

11	a)	Why is extra widening provided at horizontal curves? Derive an expression for extra widening.	5
	b)	Determine total width and length of transition curve required for a two lane highway in plain terrain at a horizontal curve of radius 320m. Design speed is 80kmph, length of wheel base = 6m and width of road = 7.5m. Assume that pavement is rotated about centre. Take rate of super elevation as 1 in 150.	9

OR

12	a)	What is the role of friction on geometric design of highways? What are the factors affecting skid resistance of a road surface?	6
	b)	Calculate stopping sight distance required on a two lane road for a design speed of 65kmph at a gradient of 2%. Adopt reaction timeof driver as 2.5sec and coefficient of friction as 0.35.	8

Module -2

13	a)	What is the relevance of hardness test for road aggregates? Explain the procedure of hardness test.	5
	b)	List out the tests conducted on bitumen. Explain ductility and penetration tests.	9

OR

14	a)	Write down the procedure to design a flexible pavement by CBR method.	7
	b)	Explain the construction steps of a bituminous concrete road	7

Module -3

15	a)	Explain the influence of vehicular characteristics on traffic flow.	6
	b)	With neat sketches describe different types of at-grade intersections	8

OR

16	a)	Discuss the objectives and methods of spot speed study	8
	b)	Calculate the optimum cycle time and green times for an isolated two phase traffic signal at an intersection formed two roads A and B. The normal and saturation flows on road A are 800PCU/hr and 2400PCU/hr respectively. Road B carries a normal flow of 750PCU/hr and saturation flow is 3000PCU/hr. Adopt the amber time as 2seconds and all red time is 12 sec.	6

Module -4

17	a)	Draw a sketch of section of a railway track and mark the components. List out the functions and requirements of different components of railway track	8
	b)	Differentiate between wet docks and dry dock. Briefly discuss types of dry docks.	6

OR

18	a)	Describe the classification of break waters and advantages of each type.	8
	b)	Write a brief note on tunnel survey. How transfer of centre line is done in tunnel survey?.	6

Module -5

19	a)	What is meant by runway orientation? Explain any one method for orientation of runway.	10
	b)	What are the factors to be considered in the selection of site for an airport?	4

OR

20	a)	Define basic runway length. Discuss various cases considered for the estimation of basic runway length.	7
	b)	Runway length required at ideal conditions is 2500m. Calculate the runway length required for a runway located at an elevation of 250m above mean sea level. The airport reference temperature is $18^{o}C$ and the runway is laid at an effective gradient of 0.2%.	7

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fourth Semester B.Tech Degree Examination June 2022 (2019 scheme)

Course Code: CET206

Course Name: TRANSPORTATION ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks) Marks

1		What are the special considerations to be taken while aligning roads on hilly areas?	(3)
2		What is camber? How it is provided on roads? List the factors affecting the amount of camber on a road.	(3)
3		Differentiate between tack coat and prime coat.	(3)
4		Write any three desirable properties of bitumen to be used in pavement construction?	(3)
5		What is the significance of passenger car unit in traffic studies?	(3)
6		Discuss the advantages and disadvantages of rotary intersections	(3)
7		Draw the layout of an artificial harbour and label its various elements	(3)
8		What is coning of wheels? Why it is necessary?	(3)
9		Distinguish between runway and taxiway.	(3)
10		What is wind rose diagram? Explain its uses.	(3)

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

11	a)	Derive an equation for equilibrium superelevation. Determine the superelevation required for a horizontal curve of radius 300m with a design speed of 80kmph under mixed traffic condition in an urban area.	(7)
	b)	Define stopping sight distance (SSD). List the factors affecting stopping distance. Derive an expression for SSD on level roads.	(7)
12	a)	A valley is formed by a descending grade of 1 in 25 meeting an ascending grade of 1 in 30. Design the length of valley curve to fulfill both comfort condition and	(7)

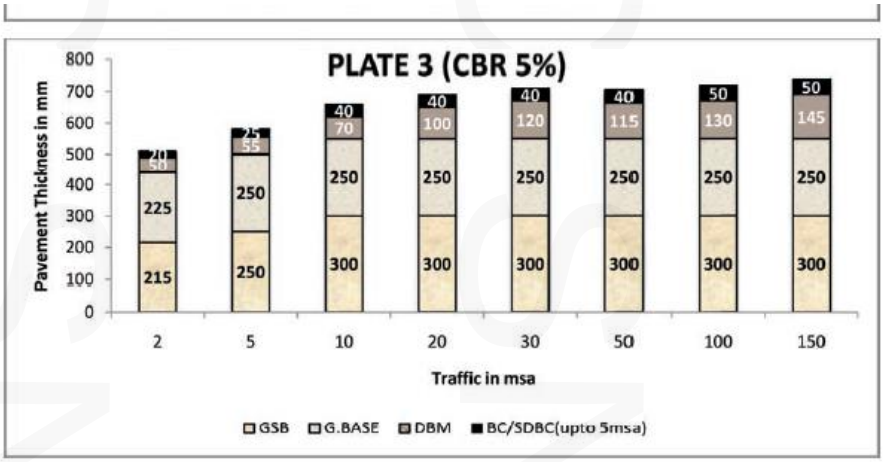
head light distance requirements for a design speed of 60 kmph. Assume allowable rate of change of centrifugal acceleration is 0.6 m/sec^3.

b) Why transition curves are provided on a horizontal curve? What are the requirements of an ideal transition curve? How do you determine the length of transition curves? (7)

Module -2

13 a) Define CBR. Design a flexible pavement for the construction of a new highway with the following data: (7)

Category of road - four lane dual carriage way, number of commercial vehicles in the year of completion of construction = 2400 CVPD per direction, design life = 15 year, annual growth rate of vehicles = 5%, design CBR value of soil subgrade = 5%, vehicle damage factor = 3.5, lane distribution factor = 0.75



b) State the major differences between flexible and rigid pavements. (7)

14 a) Describe the specifications of materials and construction steps of granular sub-base course. (7)

b) List out the properties of aggregates to be used in pavement construction. Describe any two test for judging the suitability of aggregates. (7)

Module -3

15 a) Explain various Levels of Services (LOS) as per HCM. What are the factors affecting capacity and LOS? (7)

b) A fixed time 2 phase signal is to be provided at an intersection having a N-S and E-W road where only straight ahead traffic is permitted. The hour flows are given in the table. Calculate the optimum cycle time and green time for the minimum overall delay. The integration time should be the minimum necessary (7)

for efficient operation. The time lost per phase due to starting delays can be assumed to be 2 seconds. The value of the amber period is 2 seconds. Sketch the timing diagram for each phase.

	N	S	E	W
Design hour flow (q) in PCUs/ hour	800	400	750	1000
Saturation flow (s) in PCUs/ hour	2400	2000	3000	3000

16 a) Explain how spot speed data are presented and the results used in traffic engineering. (7)

b) List the various devices used in traffic controlling and their general requirements. What are the different systems of traffic signal coordination? (7)

Module -4

17 a) Draw the cross section of a permanent way on an embankment. List the component parts of a railway track and explain their function. (7)

b) List the different types of breakwaters. What factors would guide the selection of a particular type? (7)

18 a) List and explain the different stages of setting out of centreline of tunnels. (7)

b) What are docks? Differentiate between dry dock and wet dock. (7)

Module -5

19 a) Explain with sketches, the basic patterns of runway configurations. (8)

b) Draw the layout of a typical airport and label the different components. Explain the functions of (a) Aprons (b) Hangars. (6)

20 a) The runway length required for landing at sea level in standard atmospheric conditions is 3000m. Runway length required for take-off at sea level in standard atmospheric condition is 2500m. Aerodrome reference temperature is 25 ^{0}C and that of the standard atmosphere at aerodrome elevation of 150m is 14.025 ^{0}C. If the effective runway gradient is 0.5 percent, determine the runway length to be provided. (8)

b) Explain any six site selection criteria related with the airport site selection. (6)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fourth Semester B.Tech Degree Supplementary Examination June 2023 (2019 Scheme)

Course Code: CET206

Course Name: TRANSPORTATION ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks) Marks

1		What are the objectives of preliminary survey for highway alignment?	(3)
2		List the factors governing the width of the carriageway. State the IRC specifications for width of carriage way for different classes of roads.	(3)
3		Compare the load transfer characteristics of flexible and rigid pavements.	(3)
4		List out the desirable properties of aggregates to be used in pavement construction. Also specify various tests for judging the suitability of aggregates.	(3)
5		What are the objectives of OD surveys? List the methods for collecting OD data.	(3)
6		With the help of neat sketches, differentiate between diamond interchange and trumpet interchanges.	(3)
7		Differentiate between dry dock and wet dock.	(3)
8		The ruling gradient is 1 in 200 on a particular section of a BG track. If a curve of 4 degree is situated on this ruling gradient, what should be the actual ruling gradient to be provided on this curved portion of the track?	(3)
9		Distinguish between apron and hangar.	(3)
10		Explain any three situations in which the change in direction of runway as determined from wind rose diagram is necessary?	(3)

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

11	a)	Explain the different types of gradients. What is meant by grade compensation?	(7)
	b)	Find out the length of the transition curve passing through a plain terrain for a two lane pavement with an extra widening on horizontal curve of radius 200m. The design speed = 60 kmph. Width of pavement including extra widening =7.5 m	(7)

superelevation provided = 0.07. Assume that the pavement is rotated about the centre line at a rate of 1 in 100.

12 a) Enumerate the steps for practical design of superelevation of a highway under mixed traffic conditions. (7)

b) Determine the length of overtaking zone required for one way traffic condition with design speed of 100 kmph. Acceleration of overtaking vehicle is 0.9m/sec^2 and speed of slow moving vehicle is 60 kmph. Illustrate the details of overtaking zone with a neat sketch. (7)

Module -2

13 a) Explain the procedure for obtaining the CBR value of a soil sample. (7)

b) Describe the construction practices of bituminous penetration macadam base course. (7)

14 a) Discuss any two desirable properties of bitumen and their effect on performance of bituminous mixes in pavements. Explain the laboratory tests to be conducted to assess these properties. (7)

b) Outline the IRC 37-2012 recommendations for determining the thickness of flexible pavements. (7)

Module -3

15 a) Explain the design elements of a rotary intersection. (7)

b) List out the various factors which affect the road user characteristics in traffic engineering. What are the effects of road user characteristics in traffic performance? (7)

16 a) What are the different types of traffic signs? Explain them with the help of sketches. (7)

b) Explain the significance of passenger car unit in traffic volume study. What are the factors affecting PCU values. (7)

Module -4

17 a) i) List the component parts of a railway track and explain their function. (7)

ii) Find out the length of curve for a BG curved track having 5 degree curvature and a cant of 12 cm. The maximum permissible speed on the curve is 90kmph.

b) Explain the planning aspects of a harbour basin. (7)

18 a) List and explain the different stages of setting out of centreline of tunnels.

b) Describe the construction methods of mound type break waters. (7)

Module -5

19	a)	List the factors affecting the selection of site for airport. Explain any five in detail.	(7)
	b)	The length of runway under standard conditions is 1620m. The airport site has an elevation of 270m. Its reference temperature is 32.94 ^{o}C. If the runway is to be constructed with an effective gradient of 0.20percent, determine the corrected runway length.	(7)
20	a)	What is wind rose diagram? Explain the use and types of this.	(7)
	b)	List the geometric standards of taxiway design. Explain any six in detail.	(7)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (R,S) / S2 (PT) (R,S) Examination June 2023 (2019 Scheme)

Course Code: CET206

Course Name: TRANSPORTATION ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks) Marks

1		Why extra widening is provided at curves?	3
2		Why are overtaking Zones provided? Draw a neat sketch showing the signs to be installed and their positions.	3
3		State three major differences between flexible and rigid pavements.	3
4		List the steps involved in the construction of bituminous pavement	3
5		Explain the terms traffic volume and traffic capacity	3
6		What are the various traffic control devices	3
7		What is a dry dock?	3
8		What is coning of wheels? Why is it necessary?	3
9		What are the primary functions of air traffic control?	3
10		List the components of an airport	3

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

11	a)	What are the points to be kept in view while selecting the alignment between two terminal stations	6
	b)	A car is moving with a speed of 80 kmph on a highway at a descending gradient of 4%. If coefficient of friction between the road surface and the tyres is 0.35, calculate the required minimum stopping sight distance.	8
12	a)	The speed of overtaking and overtaken vehicles is 80 kmph and 60 kmph respectively on a two-way traffic road. If the acceleration of the overtaking vehicle is 0.9 m/sec^2, calculate the safe overtaking sight distance.	10

b) Enumerate the steps for practical design of super elevation of a highway under mixed traffic conditions 4

Module -2

13 a) What are the desirable properties of bitumen to be used in pavement construction? 4

b) Design the pavement for construction of a new bypass with the following data: 10

1. Two lane carriage way
2. Initial traffic in the year of completion of construction = 400 CVPD (sum of both directions)
3. Traffic growth rate = 7.5 %
4. Design life = 15 years
5. Vehicle damage factor based on axle load survey = 2.5 standard axle per commercial vehicle
6. Design CBR of subgrade soil = 5%

For CBR 5%

Traffic msa	5	10	20	30	40	50
GSB(mm)	150	200	200	200	200	200
WMM(mm)	250	250	250	250	250	250
Base/Binder Course (mm)	65	80	105	115	130	140
Surface Course(mm)	30	40	40	40	40	40

14 a) List out the desirable properties of aggregates to be used in pavement construction. Explain in detail two tests for judging the suitability of aggregates. 8

b) Discuss the significance of the various factors to be considered in pavement design? 6

Module -3

15 a) How are the speed and delay studies carried out? What are the various uses of speed and delay study? 8

b) Explain the factors affecting level of service of a multilane highway 6

16 a) Define the terms basic capacity, possible capacity and practical capacity and its importance in traffic engineering. 8

b) What are the different types of road intersections? Illustrate with the help of sketches. 6

Module -4

17	a)	What should be the actual ruling gradient if the ruling gradient is 1 in 130 on a MG and a curve of 4 degree is super imposed on above track section?	4
	b)	What are the component parts of a railway track? Explain the functions and requirements of sleepers.	10
18	a)	What are the requirements of a good harbour?	6
	b)	Compare mound type break water with wall type breakwater with the help of sketches	8

Module -5

19	a)	Enumerate the various factors which would be kept in view while selecting suitable site for an airport.	10
	b)	What is a wind rose diagram? How is it useful in fixing the best orientation of runway?	4
20	a)	The length of runway under standard conditions is 1620 m. The airport site has an elevation of 270 m. Its reference temperature is 32.9°C. If the runway is to be constructed with an effective gradient of 0.2 percent, determine the corrected runway length.	10
	b)	Explain the function of following components in an airport. i) Taxiway ii) Apron	4

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