

**B.E. CIVIL ENGINEERING THIRD YEAR SECOND SEMESTER EXAM 2022  
TRANSPORTATION ENGINEERING II**

Time : Three hours

Full Marks : 100

**Use separate answer script for each Part**

**PART I (60 Marks)**

**Answer brief & to the point. Assume standard value for any parameter, if required**

1. Answer the following questions in brief

- a) Answer any five of the following [CO1] 5 x 2
- Name two methods of representing O&D Study data
  - Define study area of traffic survey
  - State the major difference between cruising time and running time
  - Illustrate about any one major parking statistic
  - Define the 30<sup>th</sup> highest hourly volume
  - Name the major causes of road accidents
- b) Answer any five of the following [CO2] 5 x 2
- Illustrate the major difference between a white line and a yellow line road marker
  - Name the major situations demanding all red period in a signal system
  - Following Webster's method of optimum signal cycle design, identify the parameters contributing to lost time considering there is no pedestrian phase
  - Illustrate the major difference between an erected and an inverted road signboard
  - State the significance of a center line road marker consisting of a pair of bold and dashed white line
  - Name any two of the typical cross road markers mentioning their purposes

2. Answer any two of the following

[CO1] 2 x 10

- a) calculate the average flow, journey speed and running speed of the two directions of a 1500m section of a street from the following moving car study data –

Section	Length (m)	Time Recorded (sec)	Vehicles met with		
			Opposite Direction	Overtaking	Overtaken
AB	500	152	25	8	6
B	---	15	8	--	--
BC	600	172	31	5	2
C	---	14	7	--	--
CD	400	132	22	6	9
D	---	20	10	8	--
DC	400	154	28	6	4
C	---	12	4	--	--
CB	600	160	55	6	7
B	---	18	6	--	--
BA	500	145	45	7	2

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- b) Illustrate about the following –
- i. components of an off street parking facility
  - ii. automatic methods of speed study
- c) The parking survey data collected from a parking lot by license plate method (Registration numbers as recorded) is as shown below. Find the Parking Load, Average Occupancy, Parking Volume, Average Turnover, and Average Duration of the parking lot.

Time (in min)	Bay1	Bay2	Bay3	Bay4	Bay5	Bay6	Bay7	Bay8
0-10	5417	1184	1478	7478	--	--	5048	3129
10-20	5417	1184	3708	2373	6435	--	5048	3129
20-30	--	1184	3708	2373	5449	6380	5048	8864
30-40	--	1184	3708	4975	5449	6380	5048	8864
40-50	2912	5893	3708	4975	5449	6380	7714	8864
50-60	5892	5893	3038	4975	5449	6380	--	8864

3. Answer any one of the following

[CO2]

- a) Answer any two (all carry equal marks)
- i. Illustrate in details on the warrants of installing a traffic signal
  - ii. Name the types of conflicts in an intersection and calculate the category wise conflicts expected in the intersection of two mutually perpendicular two-lane two-way roads allowing all possible flow by drawing a neat conflict diagram
  - iii. Explain the different terms involved in the Webster's formula of computing optimum signal cycle time and draw neatly the possible phase diagram of the intersection mentioned in qn 3a(ii)
- b) Draw the possible phase diagrams and compute the design optimum signal cycle time for an at grade intersection of 2nos. 4-Lane 2-way mutually perpendicular roads with the following data -

Pedestrian Green Time and crossing speed are 6 secs and 1m/s respectively. Average lane width 3.5m. Amber time and starting delay are 4sec and 3sec respectively. No accumulation of vehicles demanding clearance red. Saturation flow for 1-lane and 2-lane approaches are 1890 PCU and 3675 PCU respectively. Right turning radius of 25m. Traffic data is as recorded below with E, W, N, S indicating four directions.

From	N			S			E			W		
To	E	S	W	W	N	E	S	W	N	N	E	S
PCU	20	232	33	19	253	46	18	237	42	17	247	34

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**SUBJECT: TRANSPORTATION ENGINEERING II**  
 (Name in full)

**PAPER ××××**

**Time: Three hours**

**Full Marks =100**

(60 marks for part I and 40 Marks for part II)

Use a same Answer-Script for each part

No. of Question	<u>Part-II</u>	CO	Marks
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- 1) Answer question number 1 and question number 2,  
 2) Assume reasonable values of data if it is not supplied,  
 3) Answer the Part 1 and Part 2 separately.  
 4) There is no need of any code etc. for answering Part- II,  
 5) In the cases where excess number of questions will be answered exceeding the required number of question/s, the first required number of question/s will be evaluated only.

Sl. No.	Question		
	<i>Answer any three between 1 (a) to 1 (d)</i>		
1 (a)	What is "gauge"?	[CO4]	[2]
(b)	What will be the axle load for weight of rail of 55 kg/m?	[CO4]	[2]
(c)	What are the governing factors to fix the sleeper density?	[CO4]	[2]
(d)	Using a sleeper density of 'M+6', find out the number of sleepers required for constructing a B. G. railway track 640 m long.	[CO4]	[2]
	<i>Answer any three between 1 (e) to 1 (h)</i>		
(e)	What are the principal functions of a sleeper in a permanent way?	[CO4]	[3]
(f)	What is meant by 'wear of rail'?	[CO4]	[3]
(g)	Derive the expression for minimum depth of a ballast section with neat sketch.	[CO4]	[3]
(h)	Explain the conditions when ballast may be exempted in making of 'permanent railway track'.	[CO4]	[3]
	<i>Answer any one between 1 (i) to 1 (j)</i>		
(i)	What will be the steepest gradient on a straight track when the following conditions exist, for a train having 16 wagons when Weight of each wagon = 18 tonnes. Speed of the train = 60 kmph, Rolling resistance of wagon = 2.5 kg/tonnes, Rolling resistance of locomotive = 3.0 kg/tonnes, Weight of the locomotive = 120 tonnes, Tractive effort of locomotive = 12 tonnes, Given, resistance depending upon the speed = 0.00008 wv, atmospheric resistance = 0.0000006 wv <sup>2</sup> and resistance due to gradient = (w/g) where all notations stand for their conventional meanings.	[CO4]	[5]
(j)	With the help of proper classification & using the "tree structure", categorize the various resisting forces (which a locomotive has to encounter before starting a train and to keep it in motion). Also write down the available or conventional expression/s of each categorized resisting force (which may be used to calculate the value or amount of that particular resisting force) with the clarification of each parameter used in the expression.	[CO4]	[3+2]

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Use a same Answer-Script for each part

- Answer any three between 2 (a) to 2 (d)*
- 2 (a) Why the concept of average speed is important? [CO5] [2]  
 (b) What is gradient? [CO5] [2]  
 (c) Among 'momentum gradient' and 'pusher gradient', which one has the scope to be used frequently in mountainous region and why? Support your answer with logic. [CO5] [2]  
 (d) To work out empirically the safe speed on curves as per old practice, what are the formulae given by Martin? [CO5] [2]
- Answer any three between 2 (e) to 2 (h)*
- (e) Explain the term-"momentum gradient" [CO5] [3]  
 (f) What is 'grade compensation on horizontal curves'? [CO5] [3]  
 (g) What are differences between overturning and derailment? [CO5] [3]  
 (h) What is the equilibrium cant on a 3 degree MG curved track if 15 trains, 12 trains, 7 trains and 3 trains run at speeds of 55 kmph, 60 kmph, 75 kmph and 80 kmph respectively? [CO5] [3]
- Answer any one between 2 (i) to 2 (j)*
- (i) A 6° curve diverges from a 3° main curve in opposite direction in a layout of B. G. yard. If the speed on the branch line is limited to 24 kmph, determine the restricted speed on the main line. [CO5] [5]  
 (j) For a country like India, which option should be given more preference in your view (state with logic): (a) much more expansion and spreading of Railway network, (b) opening of more airways root with increase in the number of aircrafts (for carrying people from one place to other place)? [CO5] [5]