

**B.E. CIVIL ENGINEERING FOURTH YEAR SECOND SEMESTER SUPPLEMENTARY
EXAM 2024**

ADVANCED TRAFFIC ENGINEERING

Time: 3 Hours

Full Marks: 100

Answer ALL Questions

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

1. Write short note on traffic projection factors highlighting the application of these factors in estimating design traffic 15
2. An existing road with AADT as 2000 veh/hour is developed along with the adjacent area over a period of 2 years so as to produce an hourly average developmental traffic of 500 veh/hr and additional hourly average current traffic of 200 veh/hr. Considering compound normal growth @ 5% per annum, estimate the traffic demand after 10 years from completion of development. 10
3. If a bottleneck is created due to closure of one of the 3 lanes of a highway section which follows a parabolic flow density pattern, with neat sketches explain its impact on speed, density and shockwave of the traffic flow at bottleneck and approach to bottleneck if original flow is – 15
 - i. less than bottleneck capacity
 - ii. equal to bottleneck capacity and
 - iii. more than bottleneck capacity
4. The mean free speed and jam density on a lane of a highway are observed as 80 Kmph and 200 pcu/Km respectively. The average traffic flow on the lane is observed as 2000 pcu/Hr. A slow moving vehicle travelling at 20 Kmph enters the lane, forcing the vehicles behind to queue up and move in a platoon. Using the information, find - 10
 - i. The speed of the stream under the average flow condition.
 - ii. The flow in the queued up platoon of vehicles
 - iii. The speed of the resultant shockwave.
 - iv. The length of the queue if the slow moving vehicles remain in the stream for 2Km
5. Write short notes on 'major causes' and 'control measures' of road accident 5+5
6. The Motor vehicle consumption in a city is 4,000 million litres, there were 2000 fatal motor vehicle accidents and 200,000 non-fatal motor vehicle accidents involving 180,000 drivers; 6,500,000 motor vehicle registrations and an estimated population of 18,000,000. Travel per litre of fuel is 10 km. Calculate registration death rate, population death rate, accident involvement rate, and accident rate per vehicle km. 10
7. Deduce the standard queuing model for Probability of 'n' no of vehicles in the system given by – $P_n = \frac{\rho^n}{1-\rho}$, Where all symbols carry usual meaning. Also state the fundamental assumptions of this deduction 10+5

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8. In a gas station with 1 service channels, the average service time is 1.5 mins per vehicle per channel Considering the average arrival rate of 25 veh/hr, and both arrival and service to follow poissonian distribution, determine the following – 8
- i. The average number of vehicles in the system
 - ii. The average time spent by a vehicle in the system
 - iii. The probability of no queue in the system
 - iv. The probability of an idle system
9. Considering flow gets retarded for headway less than 6 secs, find the probability of having headway of more than 8secs from the following headway observation noted in secs. – 7
- 9.8; 3.6; 4.9; 13.5; 5.0; 10.8; 1.6; 5.3; 7.2; 18.1; 5.4; 6.8; 1.2; 12.1; 2.4; 5.0; 2.9; 7.6; 9.9; and 7.1