**Sixth Semester B.E. Degree Examination, June/July 2019**
## Traffic Engineering

Time: 3 hrs.          Max. Marks: 100

Note: *1. Answer FIVE full questions, selecting*
      *atleast TWO questions from each part.*
     *2. Use of statistical tables permitted.*

### PART – A

1   a.   Define traffic engineering. Explain briefly the objectives and scope of traffic engineering.
                 **(08 Marks)**

   b.   A vehicle moving at 40 kmph speed was stopped by applying the brakes and the length of skid mark was 12.2m. If the average skid resistance of the pavement is known to be 0.70, determine the brake efficiency of the test vehicle.      **(08 Marks)**

   c.   Explain PIEV theory.                    **(04 Marks)**

2   a.   Briefly explain human factors governing the road user characteristics.    **(06 Marks)**

   b.   Explain various resistances offered during motion of vehicle with relevant equations.
                 **(06 Marks)**

   c.   An Ambbassadar car travelling at a speed of 60kmph on a level WBM road in good condition is scuddenly allowed to coast by switching off the engine and putting the gear in neutral. What is the deceleration caused? Take weight of car = 1365kg, $f = 0.025$, $C_a = 0.39$, $A = 2.15m^2$.      **(08 Marks)**

3   a.   Mention the objectives of accident studies. Also mention the various causes of accidents.
                 **(10 Marks)**

   b.   Spot speed studies were carried out at a certain stretch of a highway and the consolidated data collected are given below. Determine :
     i. The upper and lower values of speed limits for regulation of mixed traffic flow
     ii. The design speed for checking the geometric design elements of the highway.

| Speed range kmph | No. of vehicles observed |
|---|---|
| 0 to 10 | 12 |
| 10 to 20 | 18 |
| 20 to 30 | 68 |
| 30 to 40 | 89 |
| 40 to 50 | 204 |
| 50 to 60 | 255 |
| 60 to 70 | 119 |
| 70 to 80 | 43 |
| 80 to 90 | 33 |
| 90 to 100 | 9 |

                 **(10 Marks)**

4   a.   Define PCU. What are the different factors affecting PCU? List the IRC recommended values for different vehicles.      **(08 Marks)**

   b.   Two vehicles A and B approaching at right angles. A form west and B form south, collide with each other. After collision, vehicle A skids on a direction 50° North of west and vehicle B. 60° East of North. The initial skid distances of the vehicle A and B are 38 and 20m respectively before collision. The skid distances after collision are 15 and 36m respectively. If the weights of vehicles B and A are 6 and 4.0 tonnes, calculate the original speed of the vehicles. The average skid resistance of the pavement is found to be 0.55.    **(12 Marks)**

# PART – B

5 a. Form Greenshield's theory derive the relationship between speed, flow and density. (06 Marks)

b. The off-beak traffic flow arriving at random at toll booth facility is 90veh/hr and the peak flow is 180 veh/hr. The service rate, exponentially distributed at the booth is 3.5 per minute. What is the average number of customers in the queue for each flow? (06 Marks)

c. The speed and concentration of vehicles in a traffic stream were observed and the following data were obtained. Find the regression equation for determining the speed from concentration.

| Concentration [veh/km] | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
|---|---|---|---|---|---|---|---|---|---|---|
| Speed [km ph] | 72 | 68 | 61 | 52 | 47 | 39 | 32 | 27 | 20 | 13 |

(08 Marks)

6 a. Write a short note on :
   i.   Traffic forecasting
   ii.  SIMULATION techniques (10 Marks)

b. The data given below shows the occupancy of parking lot consisting of 50 spaces. The count was taken as 15 minute interval during the 4 hours duration on 6 week days. Find by inspection whether the number of vacant spaces during any count follows a Poisson distribution.

| Occupancy of parking spaces | 50 | 49 | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | ≤ 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 6 | 15 | 21 | 20 | 15 | 10 | 5 | 2 | 1 | 1 | 0 |

(10 Marks)

7 a. With the help of neat sketch, explain elements of a traffic rotary. (06 Marks)

b. Mention different types of traffic signal system. Explain any one of them. (06 Marks)

c. The average normal flow of traffic on cross roads A and B during design period are 400 and 250 PCU/hr, the saturation flow values on these roads are estimated as 1250 and 1000 PCU/hr respectively. The all–red time required for pedestrian crossing is 12 seconds. Design two phase traffic signal by Webster's method. (08 Marks)

8  Write short notes on the following :
   a. ITS
   b. MOVING CAR observer method
   c. Mandatory signs
   d. Street lighting. (20 Marks)

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