Ref. No.: EX/CE/T/311/2019

B. E. CIVIL ENGINEERING THIRD YEAR FIRST SEMESTER EXAMINATION 2019

TRANSPORTATION ENGINEERING – I

Time: 3 Hours **Full Marks: 100**

Part I **60 marks for this part**

Use Separate Answer scripts for each Part

Answer One Question from each Group
Answer of all parts of a question MUST be written in one place.
Answers written in fragmented form will not be evaluated

Group A [15 Marks]

1. Write short notes on –; 15
   a. 2nd Road Development Plan
   b. Criteria for National & State Highway
   c. Frictional Character of road surface

2. Explain the significance of the following in geometric design of roadways – 15
   a. Length and height of the vehicles
   b. Peripheral vision of driver
   c. Psychological character of the road user

Group B [25 Marks]

3. What are the major functions of shoulder of a highway? 3

   Compute the length of minimum overtaking zone for a 4-lane 2-way divided highway for design speed of 60KmpH, maximum speed of overtaken vehicle 44KmpH, reaction time for overtaking 2secs, and acceleration of overtaking vehicle at 3.6KmpH/sec. 8

   Compute the safe radius and Design all other components of a horizontal curve for a 2-lane 2-way divided road with 3.0m shoulder followed by building line at 7.0m away from the outer edge of the shoulder. The design speed is 60KmpH; Maximum super elevation of 7% is to be provided at a rate of 1in 120 about centre line of the road; Maximum coefficient of sliding friction is 0.15; Reaction time, efficiency and coefficient of friction for breaking are 2.5secs, 90% and 0.35respectively; average length of wheel base is 4.0m. Standard lane width is 3.5m. 14

4. Find the compensated grade for a 200m radius horizontal curve in a longitudinal slope of 5%. 3

   Name different types of longitudinal gradients and briefly explain them 2+8

   ABC is part of a 2-lane 2-way divided highway where the flat portion AB with minimum gradient of 0.5% is to be connected with an upslope BC having gradient of +4%. State which type of vertical curve is suitable; compute its length and the position of the lowest / highest point of the curve. The design speed is 60KmpH; Reaction time, efficiency and coefficient of

friction for breaking are 2.5secs, 90% and 0.35respectively; Height of driver's vision, obstruction and headlight are 1.2m, 0.15m and 0.75m respectively; Headlight beam angle is 1°. Standard lane width is 3.5m. 12

Group C [20 Marks]

5. Illustrate and explain Weaving Length and Weaving Angle for a rotary with a neat diagram. 8

   Draw neatly a conflict diagram for a perpendicular intersection of 2nos 2lane 2-way road clearly labelling the conflict points. 6

   Calculate the safe radius and carriageway width for a rotary at the junction of 4 nos 4-lane 2-way approaches. The uniform freeway design speed of approaches is 60KmpH. Consider coefficient of lateral friction varying linearly between 0.47 and 0.43 for rotary design speed upto 30KmpH to 40KmpH. Standard lane width is 3.5m. 6

6. Write short notes on major three types of subsurface drainage 6

   State the criteria conditions for selection of a proper filter material for subsurface drainage. 4

   Pair of longitudinal rectangular 0.5m wide open cut side drains runs adjacent to the shoulders of a 2-lane 2-way divided highway having 3m wide shoulders on both sides. A 25m wide grassy land is sloped towards the other side of the drain. The catchment area has a length of 400m along the length of the road. The average runoff coefficients are 0.45, 0.35 and 0.25 for bituminous carriageway, compacted shoulder and grassy land respectively. The design rainfall intensity is 125mm/hr. Design the drainage system considering Manning's roughness coefficient 0.022, speed of flow 0.8 m/sec. and free board of 0.14m. The highway is not elevated on any embankment. 10

Form A: Paper-setting Blank

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B.E. CIVIL ENGINEERING THIRD YEAR FIRST SEMESTER EXAM 2019

(1st /~~2nd~~ Semester/~~Repeat/Supplementary /Spl. Supplementary /Old/Annual/Bi-Annual~~)

SUBJECT: TRANSPORTATION ENGINEERING-I

(Name in full)

PAPER ××××

Time: ~~Two hours~~/ Three hours/~~Four hours/Six hours~~ Full Marks ~~30~~/100

(~~15~~/50 marks for each part)

Use a separate Answer-Script for each part

Part -II

- *Maintain neatness.*
- *Assume reasonable data if it is not supplied.*
- *Answer any two questions*
- All drawings-must be drawn by pencil
- No code etc. will be needed to answer the questions of this part

No. of Question		Marks (40)
(1)(a)	What is "gauge"?	2
(b)	Give the typical cross-section of a permanent way on embankment with proper labeling.	7
(c)	Explain in what respects a railway permanent track differs from a. flexible major highway?	6
(d)	How adzing of sleepers, tilting of rails and coning of wheels help to provide the thread of wheels in absolutely dead centre position on the head of the rails? Take the help of neat sketch if required.	5
(2)(a)	What are factors governing choice of gauge of a proposed railway track?	4
(b)	Mention the relative merits and demerits of Flat-Footed rails (F.F. Rails).	5
(c)	Classify 'types of wear of rails' with the 'tree-structured presentation'.	4
(d)	Suggest suitable measures to reduce the effect of wear on rails.	7
(3)(a)	What are the functions of the sleeper?	3
(b)	Compare between timber, metal and concrete sleepers depending upon common points to show their relative merits or demerits.	12
(c)	Using a sleeper density of 'M+6', find out the number of sleepers required for constructing a B. G. railway track 960 m long.	2
(d)	Is there any condition where sleeper or ballast or both sleeper and ballast, is/ are not present under the rails. If so, where?	3
(4)(a)	What are the differences between wind resistance and atmospheric resistance?	3
(b)	Clarify the term: "rolling resistance".	4
(c)	With the help of proper classification, categorize the various resisting forces which a locomotive has to encounter before starting a train and to keep it in motion.	6
(d)	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	7