Ref. No.: Ex/CE/T/311/2018

B. CIVIL ENGINEERING 3RD YEAR 1ST SEMESTER EXAMINATION 2018
TRANSPORTATION ENGINEERING – I

Time: 3 Hours **Full Marks: 100**
(60 marks for THIS part)

Part – I

Use Separate Answer scripts for each Part
Answer Any SIX Questions

1. Explain different types of the power resistance of a roadway with relevant expression for power required by a vehicle 10

2. Write short note on the Design Components of a Rotary 10

3. Draw neatly any two of the following – 10
   i) Clear Sight Triangle at Major Road – Minor Road Crossing
   ii) Simple Diamond Grade separation
   iii) Suitable Grade separation for a Tee-Junction with conflict points

4. What are the different types of subsurface drainage? Name the methods adopted in each case. State the criteria for selection of proper subsurface filter material 3+3+4

5. Find the minimum length of overtaking zone for a 4-lane 2-way undivided street with for design speed of 60KmpH. Assume reaction time = 2secs, speed of overtaken vehicle = 40KmpH and Acceleration = 3.6KmpH/sec. Without changing the design speed, what geometric modification can reduce this length? 10

6. For a 2-lane 2-way divided highway with design speed = 80KmpH, reaction time for breaking = 2.5secs, coefficient of braking friction = 0.34, breaking efficiency = 90%, maximum speed of overtaken vehicle = 64KmpH, reaction time for overtaking = 2secs, acceleration of overtaking vehicle = 3.6KmpH/sec, Design a suitable horizontal curve with all components at a section of the highway with longitudina' lope of 0.5%. Assuming the roadway, which is at 0.5m embankment constructed with side slope of 1(H):2(V) has 3m wide shoulder on both sides, find the minimum distance of building line from the centre line to provide unobstructed visibility for possible design sight distances. Consider, maximum super-elevation of 7% provided about centre line at a rate of 1 in 120; maximum coefficient of lateral friction = 0.15; and length of rigid wheel base = 6m 10

7. ABC is a 2-lane 2-way divided highway where the longitudinal slopes of the AB and BC portion are (+) 1 in 40 and (+) 1 in 20 respectively. Fit a suitable vertical curve and find its length along with the position of the lowest / highest point of the curve, as the case may be against possible design sight distance considering, Design speed = 80KmpH, reaction time for breaking = 2.5secs, coefficient of braking friction = 0.34, breaking efficiency = 90%, maximum speed of overtaken vehicle = 64KmpH, reaction time for overtaking = 2secs, acceleration of overtaking vehicle = 3.6KmpH/sec. 10

8. Pair of longitudinal rectangular 300mm wide open cut side drains runs adjacent to the shoulders of a 2-lane 2-way divided highway on ground level having 3m wide shoulders on both sides. A 20m wide grassy land is sloped towards the other side of the drain. The catchment area has a length of 500m 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 inlet time from the furthest point to the drain is 11.25min and the rainfall intensity for design return period is 115mm/hr for 19min duration and 130mm/hr for 20min duration. Design the drainage system considering Manning's roughness coefficient 0.022, speed of flow 0.8 m/sec. and free board of 0.14m.

Form A: Paper-setting Blank

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B.E. CIVIL ENGINEERING THIRD YEAR FIRST SEMESTER EXAM 2018

(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**

(~~45~~/50 marks for each part)

Use a separate Answer-Script for each part

Part -II

No. of Question — Marks (40)

- *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

(1)(a)	Mention the relative merits and demerits of Flat-Footed rails (F.F. Rails).	5
(b)	Classify 'types of wear of rails' with the 'tree-structured presentation'.	5
(c)	Suggest suitable measures to reduce the effect of wear on rails.	7
(d)	What are the differences between wind resistance and atmospheric resistance?	3
(2)(a)	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.	5
(b)	What is "gauge"?	2
(c)	Give the typical cross-section of a permanent way on embankment with proper labeling.	7
(d)	Clarify the term: "rolling resistance".	3
(e)	What are the functions of the sleeper?	3
(3)(a)	Compare between timber, metal and concrete sleepers depending upon common points to show their relative merits or demerits.	10
(b)	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	6
(c)	What are factors governing choice of gauge of a proposed railway track?	4
(4)(a)	Determine the speed at which wagons with 14 tone axle load may be permitted to run on track with worn rails of I = 387.51 cm^4 and Z = 72.75 cm^3. Take track modulus as 53.5 kg/cm^2 and permissible stress with speed effect as 23.7 kg/mm^2 Also determine the maximum rail seat load on a sleeper for the above conditions when the sleeper spacing is 70 cm.	4+2=6
(b)	Explain in what respects a railway permanent track differs from a. flexible major highway?	6
(c)	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.	6
(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.	2