

Ref.No.Ex/CE/5/I/304/2022

BACHELOR OF ENGINEERING (CIVIL ENGINEERING) EXAMINATION 2022
[Third Year; Second Semester]
Transportation Engineering - I

Total Time: Three Hours

Full Marks 100
(Part I: 40 + Part II: 60)

Use a separate Answer-Script for each part

Part I (40 Marks)

Attempt All Questions

(4 × 10 = 40)

- 1 (a) Define highway alignment and its requirements. (3)
- (b) Explain the 'Obligatory Points' in connection with the highway alignment. (4)
- (c) What are the special considerations for highway alignment that are to be considered for hilly areas? Explain in brief. (3)
- 2 (a) Write the importance of the 'Reconnaissance' in connection to the highway alignment and surveys. (3)
- (b) Explain the principles of Re-Alignment of a highway project. Draw a neat sketch of 'Highway cross-section in embankment' indicating all possible details. (4)
- (c) What are skid and slip? What are the factors associated with friction/skid resistance? (3)
- 3 (a) Derive the expression of SSD. What do you mean by OSD? Explain the OSD with necessary assumptions and steps. (6)
- (b) Explain the PIEV theory. (4)
- 4 (a) The speed of overtaking and overtaken vehicles A and B are 100 and 50 kmph, respectively, on a 2-lane one-way traffic road. If the acceleration of overtaking vehicle is 1 m/sec^2 , and the speed of vehicle C coming from the other side and opposite direction is 80 kmph, calculate the safe overtaking sight distance required for vehicle A. (5)
- (b) Design the rate of superelevation for a highway curve of radius 500 m and speed 100 kmph which necessary assumptions and stipulated considerations. (5)

**BACHELOR OF ENGINEERING (CIVIL ENGINEERING) THIRD YEAR SECOND
SEMESTER EXAM 2022**

Time: 4 Hours

TRANSPORTATION ENGG.-I

Full Marks: 60

Part - II

Answer Each Part in Separate Answer Script

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

1. Answer the following in one or two words 1 x 15
- The length of the vehicle is an important factor in planning of _____ & _____
 - The visual acuity of the driver is an important factor in planning of _____ & _____
 - The accelerating power of the vehicle is an important factor in planning of _____ & _____
 - Among the surface friction deficiency problems _____ is less hazardous to _____
 - What is the range of tolerable roughness index of road?
 - For which reason light coloured surface pavement is normally avoided?
 - Which type of capacity as defined in HCM 1956 was renamed in HCM 1985?
 - How many levels of services are normally adopted in India?
 - Which is steeper - Momentum Gradient or Ruling Gradient?
 - What is the degree of a 350m radius curve on a BG track?
 - What are the standard widths of BG and NG tracks in India?
 - What is the normal range of peripheral vision in the horizontal axis?
 - Why is the Pusher Gradient so named?
 - In Indian standard the gauge is the distance between _____ of rails
 - Name any two problems associated with change of gauge
2. Answer any Five questions 5 x 5
- Write short note on 'PIEV'
 - Write full form of PCU and explain the same with at least two typical example values of PCU
 - What is GVW? How is it determined? What is its value for a truck with distance between extreme axles as 5m?
 - Write major functions of rail.
 - Explain in detail the change of capacity definition between HCM 1956 and HCM 1985.
 - Explain Cant Deficiency and Cant Excess.
 - State the major requirements of a good sleeper
 - Explain with a neat sketch - Negative superelevation in rail.
3. Answer any Four questions 4 x 5
- A 6° curve diverges from a 3° main curve in the opposite direction in a layout of B.G. yard. If the speed on the branch line is limited to 24 kmph., determine the negative superelevation to be provided on the branch line and the permissible speed on the main line.
 - Calculate the superelevation and the maximum permissible speed for a 3° BG transitioned curve on a high-speed route with a maximum sanctioned speed of 110 km/h. The speed for calculating the equilibrium superelevation as decided by the chief engineer is 80 km/h and the booked speed of goods trains is 50 km/h.
 - Considering grade compensation, Find the steepest gradient on a 2° curve for a line with a ruling gradient of 1 in 200 when the line is in (i) B.G., (ii) M.G. and (iii) N.G.
 - Considering General Capacity method of design find the minimum number of lanes required in the highway for design flow of 1700PCU/Hr for
 - Basic Capacity of 1800 PCU/Hr/Lane and
 - Practical Capacity of 1800 PCU/Hr/Lane
 - Considering Level of Service Principle, Design a highway for design speed and number of lanes satisfying LoS A condition with limiting speed and q/c ratio as $0.85v_f$ and 0.2 respectively. The speed-density relationship is $[v = v_f - v_f/k_j \cdot k]$ where symbols carry usual meaning. Mean free speed is 60Kmph and jam density is 120Kmph