SAMPLE PAPERS

DIPLOMA FIFTH SEMESTER EXAMINATION 2025 (JUT)

TRANSPORTATION ENGINEERING

DIPLOMA WALLAH

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Full Marks: 70 marks | Time: 3 Hours

Instructions:

- Question No. 1 is compulsory.

- Answer any **FOUR** questions from the remaining (Q.2 to Q. 7 marks).

SECTION A: Compulsory Multiple Choice Questions (MCQs)

Q. 1. Choose the correct option for the following: **(7 × 2 = 14 Marks)**

i. The maximum value of super elevation recommended by IRC for plain and rolling terrain is:

(a) 1 in 10

(b) 1 in 15

(c) 1 in 12.5

(d) 1 in 20

ii. The maximum dry density (MDD) of soil is achieved at:

(a) The optimum moisture content (OMC)

(b) The shrinkage limit

(c) 100% saturation

(d) The plastic limit

iii. Which of the following is NOT a fundamental parameter of traffic flow?

(a) Speed

(b) Volume

(c) Reaction time

(d) Density

iv. The standard height of the eye-level of the driver for calculating Stopping Sight Distance (SSD) as per IRC is:

(a) 1.2 m

(b) 1.5 m

(c) 0.75 m

(d) 1.05 m

v. The function of a **Ballast** in a railway track is primarily to:

(a) Transfer the load directly to the formation

(b) Hold the track to line and level and provide drainage

(c) Guide the wheels

(d) Bear the wheel load

vi. The primary function of **Tack Coat** in bituminous construction is to:

(a) Serve as a wearing course

(b) Provide bond between the existing surface and the new layer

(c) Prevent the entry of surface water

(d) Act as a protective layer over the subgrade

vii. The type of joint provided in a rigid pavement to relieve stress due to temperature rise is a/an:

(a) Contraction Joint

(b) Expansion Joint

(c) Warping Joint

(d) Longitudinal Joint

SECTION B: Long Answer and Short Notes Questions

(Answer any FOUR questions from Q. 2 to Q. 7. Each question carries 14 Marks.)

Q. 2. (A) Define Super Elevation and state its purpose. Derive the necessary expression for calculating the equilibrium super elevation required on a horizontal curve. (7 Marks)

(B) Explain the structure and function of the layers in both Flexible Pavements and Rigid Pavements. (7 Marks)

Q. 3. (A) Explain the objectives and main recommendations of the Jayakar Committee. Discuss the impact of its report on the development of Indian roads. (7 Marks)

(B) What is the significance of the California Bearing Ratio (CBR) Test in flexible pavement design? Describe the laboratory procedure of the CBR test. (7 Marks)

Q. 4. (A) What are the three fundamental parameters of Traffic Flow (Q, K, V)? Explain the relationship between them and how they are determined using the moving observer method. (7 Marks)

(B) What is Road Drainage? Explain the necessity and objectives of a good drainage system. Differentiate between Surface Drainage and Sub-Surface Drainage systems. (7 Marks)

Q. 5. (A) Define the different types of Sight Distances. Derive the expression for Stopping Sight Distance (SSD). (7 Marks)

(B) Draw a neat labelled diagram showing all the essential component parts of a Railway Track (Permanent Way). Explain the function of each component. [Draw a neat labelled diagram of a railway track cross-section] (7 Marks)

Q. 6. (A) List the desirable properties of Aggregates used in road construction. Describe the laboratory procedure for conducting the Los Angeles Abrasion Test. (7 Marks)

(B) What is Extra Widening (W_e)? Draw a neat cross-section of a two-lane carriageway on a horizontal curve, showing and labelling the necessary elements like super elevation and extra widening. (7 Marks)

Q. 7. Write short notes on any FOUR of the following: ($4 \times 3.5 = 14$ Marks)

(A) Define Gauge and Coning of Wheels in Railway Engineering.

(B) Explain the objectives and use of Spot Speed Studies.

(C) What are Cutback Bitumen and Bitumen Emulsion? State their respective uses.

(D) Define OMC and MDD and explain their significance.

(E) Briefly define Apron, Taxiway, and Runway in Airport Engineering.

ANSWER KEY & MODEL SOLUTIONS (Paper 1)

MCQ Answer Key (Q. 1)

Q. No.	Answer
i.	(c)
ii.	(a) The optimum moisture content (OMC)
iii.	(c) Reaction time
iv.	(a) 1.2 m
v.	(b) Hold the track to line and level and provide drainage
vi.	(b) Provide bond between the existing surface and the new layer

Q. No.	Answer
vii.	(b) Expansion Joint

Short Answer Solutions (Q. 7)

(A) Define Gauge and Coning of Wheels:

- **Gauge:** The clear distance between the inner faces of the two rails forming a track. In India, common gauges are Broad Gauge (1.676 m), Metre Gauge (1.000 m), and Narrow Gauge (0.762 m).

- **Coning of Wheels:** Providing a slope (taper) to the treads of the railway wheels (usually 1 in 20). This is done to help the wheel set center itself on the straight track and reduce the wear and tear on the rail flanges while navigating curves.

(B) Explain the objectives and use of Spot Speed Studies:

- **Objective:** To determine the speed distribution of vehicles at a specific location (spot) on a highway under current flow conditions.

- **Use:** Establishing safe speed limits, evaluating the effectiveness of traffic control devices, and analyzing accident occurrences at a specific point.

(C) What are Cutback Bitumen and Bitumen Emulsion? State their respective uses:

- **Cutback Bitumen:** Bitumen whose viscosity has been reduced by blending it with a volatile petroleum solvent (like kerosene or diesel). **Use:** Used for Prime Coat and Tack Coat where heating bitumen is difficult or impractical.

- **Bitumen Emulsion:** A mixture of fine droplets of bitumen and water, stabilized by an emulsifying agent. **Use:** Used in cold applications like patchwork, soil stabilization, and surface dressing, especially in rainy seasons.

(D) Define OMC and MDD and explain their significance:

- **Optimum Moisture Content (OMC):** The moisture content at which a soil can be compacted to its maximum dry density using a specified effort (like the Modified Proctor Test).

- **Maximum Dry Density (MDD):** The highest dry density achieved by a soil at its OMC.

- **Significance:** These values are crucial for quality control during the construction of earthworks (embankments and subgrades). Achieving MDD ensures maximum strength, minimum future settlement, and low void ratio, increasing the stability of the foundation.