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 first systematic road construction was carried out under the system of:

(a) Telford

(b) Macadam

(c) Tresaguet

(d) Roman

ii. The type of cross-sectional element provided in a road to prevent lateral displacement of the pavement surface is:

(a) Shoulder

(b) Kerb

(c) Median

(d) Right of Way

iii. The standard height of the object for calculating Stopping Sight Distance (SSD) as per IRC is:

(a) 0.15 m

(b) 1.2 m

(c) 0.75 m

(d) 1.5 m

iv. The traffic speed corresponding to the maximum flow on a highway is termed as:

(a) Free flow speed

(b) Optimum speed

(c) Spot speed

(d) Time mean speed

v. In the **Softening Point Test** for bitumen, the two standard balls start falling when the temperature reaches the softening point. The purpose of this test is to assess the bitumen's:

(a) Hardness

(b) Viscosity

(c) Temperature susceptibility

(d) Ductility

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

(a) Improve skid resistance

(b) Seal the surface and fill voids in the base course

(c) Act as a protective layer over the subgrade

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

vii. Which term in Tunnelling refers to the removal of excavated rock or soil from the tunnel face?

(a) Shoring

(b) Mucking

(c) Heading

(d) Grouting

SECTION B: Long Answer and Short Notes Questions

Q. 2. (A) Define the different types of Sight Distances (SSD, OSD, ISD). Derive the expression for Stopping Sight Distance (SSD) and use the formula to calculate the minimum SSD required for a design speed of 65 kmph on a down-gradient of 3% (Assume coefficient of friction, f=0.35 and reaction time, t=2.5 seconds). (7 Marks)

(B) List the different types of Joints provided in Cement Concrete Pavements. Describe the function of the Contraction Joint and the Expansion Joint with the help of a neat diagram. (7 Marks)

Q. 3. (A) What are the ideal requirements for a good Highway Alignment? Explain the four major factors affecting the alignment of a new highway. (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) Explain the structure and function of the layers in both Flexible Pavements and Rigid Pavements. Give a detailed comparison of their advantages and disadvantages. (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 (e.g., Rails, Sleepers, Ballast). (7 Marks)

Q. 5. (A) Explain the objectives and scope of Origin and Destination (O-D) Studies. Describe the detailed methodology of the Roadside Interview Method for conducting O-D surveys. (7 Marks)

(B) What is meant by Tunnelling? List the advantages of constructing a Tunnel over open-cut excavation. Describe the different shapes/cross-sections used for tunnels. (7 Marks)

Q. 6. (A) Discuss the objectives of Road Safety Auditing. What are the primary causes of road accidents in India, and what are the three main "E"s (Engineering, Enforcement, Education) to reduce them? (7 Marks)

(B) List the desired properties of Bitumen. Describe the laboratory procedure for conducting the Softening Point Test on bitumen, stating the significance of the result. (7 Marks)

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

(A) Define Right of Way (ROW) and Shoulder.

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

(C) Define Equivalent Single Wheel Load (ESWL).

(D) What is Road Drainage? Differentiate between Surface Drainage and Sub-Surface Drainage.

(E) Define Time Mean Speed and Space Mean Speed in traffic flow.

ANSWER KEY & MODEL SOLUTIONS (Paper 3)

MCQ Answer Key (Q. 1)

Q. No.	Answer
i.	(c) Tresaguet
ii.	(b) Kerb
iii.	(a) 0.15 m
iv.	(b) Optimum speed
v.	(c) Temperature susceptibility
vi.	(b) Seal the surface and fill voids in the base course
vii.	(b) Mucking

Short Answer Solutions (Q. 7)

(A) Define Right of Way (ROW) and Shoulder:

- **Right of Way (ROW):** The total land width acquired for the construction of the road, including its future expansion, road margins, and side slopes.
- **Shoulder:** The strip of land adjacent to the carriageway, used for emergency parking, temporary stoppage, and providing lateral support to the pavement structure.

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

- **Cutback Bitumen:** Bitumen whose viscosity is reduced by blending it with a volatile petroleum solvent (e.g., diesel). **Use:** Used for Prime Coat and Tack Coat where heating bitumen is difficult.
- **Bitumen Emulsion:** A mixture of fine droplets of bitumen and water, stabilized by an emulsifying agent. **Use:** Used for cold applications like patchwork, surface dressing, and cold mixing.

(C) Define Equivalent Single Wheel Load (ESWL):

- **Definition:** ESWL is the magnitude of a single wheel load that causes the same stress or deflection at a critical point in the pavement structure as that caused by a specific wheel group (dual wheels or tandem axles) of the vehicle.
- **Use:** It simplifies the design of flexible pavements by converting complex multiple-wheel loading into an equivalent single load for calculation purposes.

(D) What is Road Drainage? Differentiate between Surface Drainage and Sub-Surface Drainage:

- **Road Drainage:** The process of effectively removing surface and sub-surface water from the pavement and subgrade layers.
- **Surface Drainage:** Deals with the removal of rainwater falling directly on the road surface and adjacent shoulders (using camber, side drains, and gutters).
- **Sub-Surface Drainage:** Deals with the removal of groundwater and capillary moisture from within the pavement layers and subgrade (using perforated pipes, filter layers, and trenches).