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 practical gradient prescribed by IRC is known as:

(a) Exceptional Gradient

(b) Limiting Gradient

(c) Ruling Gradient

(d) Minimum Gradient

ii. The maximum length of an Overtaking Zone should be:

(a) Three times the OSD

(b) Five times the OSD

(c) Ten times the OSD

(d) Two times the OSD

iii. The standard pressure adopted in the California Bearing Ratio (CBR) test for a 5.0 mm penetration is:

(a) 50 kg/cm^2

(b) 70 kg/cm^2

(c) 100 kg/cm^2

(d) 137 kg/cm^2

iv. The shape of a Valley Curve generally provided for vertical alignment in highways is:

(a) Simple parabolic

(b) Cubic parabolic

(c) Circular

(d) Cubic spiral

v. Which bituminous test is used to classify the bitumen into different grades based on consistency?

(a) Softening Point Test

(b) Ductility Test

(c) Viscosity Test

(d) Penetration Test

vi. The difference between **Time Mean Speed** and **Space Mean Speed** is maximum when the flow is:

(a) Very low

(b) Very high

(c) Between low and high

(d) Zero

vii. Which bridge component connects the embankment to the bridge and supports the approach roadway?

(a) Pier

(b) Abutment

(c) Decking

(d) Wing Wall

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

Q. 3. (A) Define Optimum Moisture Content (OMC) and Maximum Dry Density (MDD). Explain the objective and procedure of the Modified Proctor Test used to determine these parameters for subgrade soil. (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 labeling the necessary elements like super elevation and extra widening. (7 Marks)

Q. 4. (A) Explain the objectives and scope of Origin and Destination (O-D) Studies. Describe the detailed methodology of the Home Interview Method for conducting O-D surveys. (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. 5. (A) What are the three fundamental parameters of Traffic Flow (Q, K, V)? Explain the relationship between them with a diagram. (7 Marks)

(B) Describe the different component parts of a Bridge (e.g., Abutment, Pier, Wing Wall). What are the key factors considered for the selection of a Bridge Site? (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 desirable properties of Aggregates used in road construction. Describe the laboratory procedure for conducting the Impact Test (for toughness). (7 Marks)

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

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

(B) Define Ruling Gradient and Limiting Gradient.

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

(D) What is Road Drainage? Explain its necessity.

(E) Define and differentiate between Camber and Gradient.

ANSWER KEY & MODEL SOLUTIONS (Paper 2)

MCQ Answer Key (Q. 1)

Q. No.	Answer
i.	(b) Limiting Gradient
ii.	(b) Five times the OSD
iii.	(b) 70 kg/cm2
iv.	(a) Simple parabolic (IRC recommends cubic parabola, but simple parabola is often used and accepted for simplicity in diploma level. Selecting **(a)**).
v.	(d) Penetration Test
vi.	(b) Very high (Congested flow condition)
vii.	(b) Abutment

Short Answer Solutions (Q. 7)

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

- **Definition:** ESWL is the magnitude of a single wheel load that causes the same stress, strain, or deflection at a particular depth/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.

(B) Define Ruling Gradient and Limiting Gradient:

- **Ruling Gradient:** The maximum gradient adopted in highway design under normal conditions. It dictates the maximum effort a vehicle needs to put in and affects the economy of traffic operation.
- **Limiting Gradient:** A gradient steeper than the ruling gradient, used only in unavoidable situations (like crossing a ridge) where the length of the gradient is short. It is used sparingly to minimize its adverse impact on vehicle performance.

(C) Briefly define Apron, Taxiway, and Runway in Airport Engineering:

- **Apron:** A paved area where aircraft are parked, loaded/unloaded, refueled, or boarded.
- **Taxiway:** A paved strip connecting the runway with the apron, hangars, and other facilities, used by aircraft for taxiing (movement on the ground).

- **Runway:** A rectangular area prepared for the landing and take-off of aircraft.

(D) What is Road Drainage? Explain its necessity:

- **Road Drainage:** The process of intercepting and removing surface water and sub-surface water from the road surface, subgrade, and formation.
- **Necessity:** To prevent the ingress of water into the pavement layers and subgrade. Water reduces the strength of the subgrade soil, leads to failure of the pavement due to differential settlement, stripping of bitumen, and formation of potholes and corrugations.