

Highway Engineering (313323)

MSBTE Diploma · K-Scheme · Model Question Paper — Set C

Time: 3 Hours**Max. Marks: 70****Instructions:**

1. All questions are compulsory.
2. Answer each next main question on a new page.
3. Illustrate your answers with neat sketches wherever necessary.
4. Figures to the right indicate full marks.
5. Assume suitable data, if necessary.
6. Use of non-programmable electronic pocket calculator is permissible.
7. Mobile phone, pager and any other electronic communication devices are not permissible in the examination hall.

Q.1 Attempt any FIVE of the following:**10**

- a) Enlist any four modes of transportation.
- b) Define road alignment.
- c) Define design speed. State the IRC ruling design speed for a National Highway in plain terrain.
- d) Define: (i) Shoulder (ii) Side slope.
- e) Enlist any four types of roads according to the material used in construction.
- f) Define summit curve and valley curve.
- g) Define surface drainage of a road.

Q.2 Attempt any THREE of the following:**12**

- a) State the objectives of geometric design of highways.
- b) Calculate the sight distance required to avoid head-on collision of two vehicles approaching from opposite directions on a single-lane road (two-way traffic). Design speed 50 km/h, reaction time 2.5 s, coefficient of friction 0.37 and brake efficiency 80 %.
- c) State any four factors affecting the selection of gradient of a road.
- d) Explain super-elevation and derive the relation $e + f = \frac{V^2}{127 R}$ with a neat sketch.

Q.3 Attempt any THREE of the following:**12**

- a) Define camber. Draw neat sketches of the different types of camber.
- b) State any four desirable properties of bitumen. State the necessity of the extraction test on bituminous mix.

- c) Explain the functions of the following layers of a flexible pavement: (i) Subgrade (ii) Sub-base (iii) Base course (iv) Wearing course.
- d) State any four causes of landslides and any two measures to prevent them.

Q.4 Attempt any THREE of the following:

12

- a) Differentiate between rigid and flexible pavement with respect to: (i) load transfer (ii) initial cost (iii) design life (iv) joints.
- b) Define traffic volume study. State its purposes and methods of counting.
- c) State the common devices used to control and regulate traffic and give one use of each.
- d) Draw a neat labelled cross-section of a road showing its surface drainage system. Also show a drain provided with grating.
- e) Explain the remedial measures for pothole formation and rut formation in flexible pavements.

Q.5 Attempt any TWO of the following:

12

- a) A two-lane highway (carriageway 7.0 m) in plain terrain has a horizontal curve of radius 300 m. The design speed is 80 km/h. Design the super-elevation ($f = 0.15$) and calculate the extra widening required, taking wheel base 6.1 m. Find the raising of the outer edge for the widened pavement.
- b) Describe the sequence of construction of a cement concrete pavement. Show the expansion and contraction joints with sketches.
- c) Draw a neat cross-section of a National Highway in embankment and state the purpose of providing right of way, side slopes, road margin, side drains, berms and temporary land.

Q.6 Attempt any TWO of the following:

12

- a) Explain the components of a hill road with a neat sketch. Explain how drainage is provided on hill roads.
- b) Draw two road signs each of the following types: (i) Warning signs (ii) Mandatory signs (iii) Informatory signs.
- c) Define PCU. A classified traffic count at a rural road section gave the following hourly volumes: cars/jeeps 420, motor cycles/scooters 650, buses 85, trucks 110, light commercial vehicles 60, cycles 140 and bullock carts 12. Find the traffic volume in PCU per hour using IRC values.

Note: This is a **model question paper prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in