

**III B.Tech. II Semester Supplementary Examinations,  
November/December -2005  
TRANSPORTATION ENGINEERING  
(Civil Engineering)**

**Time: 3 hours****Max Marks: 80**

**Answer any FIVE Questions  
All Questions carry equal marks**

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1. (a) Bring out the efforts made in India for a planned development of highway system and discuss the salient features of various road plans.  
(b) While fixing the new highway route location, what factors play a major role? Explain. [10+6]
2. (a) Define stopping sight distance and explain its importance in road safety. Derive an equation for computing stopping sight distance.  
(b) A vertical summit curve is formed by an ascending gradient of 1 in 30 meeting a descending gradient of 1 in 40. The curve is to be designed for overtaking sight distance for a speed of 80 kmph. The rate of acceleration during overtaking process is 1.5 kmph/sec. Compute the length of the summit curve. [8+8]
3. (a) What are the purposes for which traffic volume data is to be collected? Explain. Also explain manual method of traffic volume counts.  
(b) What are the guiding principles for intersection design? Explain. Also explain how traffic islands can be effectively used for better traffic movement with the help of diagrams. [8+8]
4. (a) Differentiate between flexible and rigid pavements. Explain the construction procedure of a rigid pavement.  
(b) What are the desirable properties of road aggregates? Discuss and give their importance. [8+8]
5. (a) Discuss about the different gradients adopted in geometric design of railway track.  
(b) A curve of  $5^\circ$  is situated on a B.G.track. If the maximum permissible speed on curve is 60 kmph, determine the equilibrium cant. What is the maximum speed that can be permitted allowing maximum cant deficiency? [8+8]
6. (a) What is the role played by sleepers in a permanent way? Discuss. Also explain about the fastenings associated with sleepers.  
(b) Give a neat sketch of a right hand turn out and indicate various components. Explain its working principle. [8+8]
7. (a) Explain the characteristics of an aircraft that influence the planning of an airport.

- (b) What are the various corrections that are to be applied to standard runway length to obtain actual length of runway? Explain. [8+8]

8. Write short notes on the following: [4x4=16]

- (a) Super elevation
- (b) CBR method of pavement Design
- (c) Marshalling yard and functions
- (d) Wind rose diagram.

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1. (a) Explain the relationship between development of roads and the overall development of the society. Also explain the salient features of the first 20 year road development plan.  
(b) Discuss about the general principles that control the highway alignment. [8+8]
2. (a) Giving the analysis of various forces acting on a vehicle moving on a horizontal curve, derive an equation for super elevation.  
(b) Derive an equation for calculating the overtaking sight distance for a two-lane two-way road. [8+8]
3. (a) What is the basic concept of a rotary intersection? Give a neat sketch of a rotary intersection and briefly describe various design elements.  
(b) What is the need for accident studies? Discuss. Also discuss about the measures with which accident rate can be reduced. [8+8]
4. (a) Explain clearly the IRC method of design of a rigid pavement.  
(b) Describe the step by step procedure of construction of WBM road. [8+8]
5. (a) Giving a neat sketch of a permanent way cross section, show the various components. Also describe the functions of each component.  
(b) Derive a relationship between superelevation, speed, gauge and radius at a horizontal curve on a railway track. [8+8]
6. (a) What do you understand by creep of rails? Explain the theories associated with creep.  
(b) On a main BG line curve of  $4^\circ$ , a branch line  $7^\circ$  is taken out in opposite direction. The speed limit on main line is 57 kmph. Determine the maximum permissible speed on branch line. [8+8]
7. (a) Clearly explain the use of wind rose diagram in fixing the orientation of the runway.  
(b) What are the design elements connected with a runway? Explain. [8+8]
8. Write short notes on the following:
  - (a) Road Network patterns
  - (b) Traffic signs

(c) Coning of wheels

(d) Corrections for runway length.

[4x4=16]

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1. (a) Explain the role played by various 20 year road development plans in our country's development.  
(b) Explain the engineering surveys needed for a highway project. [8+8]
2. (a) Derive an expression for the rate of super elevation on a horizontal curve analysing the forces acting on a vehicle moving on the curve .  
(b) A horizontal curve of 300m radius is to be designed on a road with a design speed of 60 kmph. The road is having 7.0 m width and the super elevation needs to be provided by rotating the pavement with respect to inner edge. The rate of introduction of super elevation is 1 in 150. If the maximum wheel base for any vehicle is 6 m , calculate the length of transition curve. [8+8]
3. (a) Discuss the possible causes of road accidents and the remedial measures to reduce the accident rate.  
(b) With the help of suitable sketches , explain how traffic islands can improve traffic flow at an intersection. [8+8]
4. (a) What kind of problems can be expected in a flexible pavement due to improper maintenance? Discuss.  
(b) Explain the method of construction of cement concrete pavement by alternate bay and continuous bay methods. [6+10]
5. (a) Give a neat sketch of a left hand turn out and describe it's operation.  
(b) Why is it necessary to provide a negative superelevation on a railway track? Explain the situation with the help of a sketch. [8+8]
6. (a) What are the functions of ballast in a railway track? Explain . Also give the requirements of a good ballast material.  
(b) Explain the different types of gradients connected with the geometric design of railway track. [8+8]
7. (a) What functions are to be served by an airport terminal building? What factors are to be considered while planning and designing a terminal building? Explain.  
(b) The length of a runway under standard conditions is 1640 m. The airport site has an elevation of 280 m. The reference temperature is 33.5°C. If the runway is to be constructed with an effective gradient of 0.20 percent , determine the corrected runway length. [8+8]

8. Write short notes on the following:

[4x4=16]

- (a) Extra widening on a horizontal curve
- (b) Overtaking Sight Distance
- (c) Creep of rails
- (d) Difference between highway pavement and airfield pavement.

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1. (a) Comparing the Nagpur Road Plan with second 20 year road plan , bring out the important features of both the plans.  
(b) What are the requirements of a good highway alignment ? What factors influence the alignment of highways? Explain. [8+8]
2. (a) Clearly explain the need for super elevation on a horizontal curve. Also explain the steps involved in the design of super elevation.  
(b) The speeds of overtaking and overtaken vehicles are 80 kmph and 60 kmph respectively on a highway . The design speed of the highway is 80 kmph. The road is two-lane road meant for two-way traffic. The acceleration of overtaking vehicle is 2.5 kmph/sec. Calculate the safe overtaking sight distance required. Assume any other data required suitably. [8+8]
3. (a) What is Origin-Destination study? Explain the methodology of conducting O-D surveys and discuss how the data collected can be used.  
(b) Why intersection is considered as an important component of road system? Explain the various types of at-grade intersections possible with the help of suitable sketches. [8+8]
4. (a) Explain the method of design of a flexible pavement by Group Index method? What are the draw backs of the method? Explain.  
(b) Describe the construction procedure of a Water Bound Macadam road. [10+6]
5. (a) Giving a neat sketch of the cross section of a permanent way, show the various components. Also describe the functions of each component.  
(b) Define ‘creep’ of rails and explain the various theories associated with it. [8+8]
6. (a) What are the various signals used in regulating the movement of trains in and around station yard? Explain.  
(b) A curve of  $6^\circ$  is situated on a B.G.track. If the maximum permissible speed on curve is 60 kmph, determine the equilibrium cant. What is the maximum speed that can be permitted allowing cant deficiency? [8+8]
7. (a) What are the various design elements associated with a runway and what are their design standards? Explain.  
(b) Explain the use of wind rose diagram for finalising the runway orientation. [8+8]

8. Write short notes on the following:

[4x4=16]

- (a) Road Network patterns
- (b) Vertical curves for highways
- (c) Sleepers and associated fastenings
- (d) Aircraft characteristics.

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