

# UNIT-1

## PART:A

1. What is meant by "TRANSPORTATION".
2. List twenty-year road development plans.
3. Mention any two Recommendation of Jayakar committee.
4. What are the functions of IRC and CRRI.
5. Define "Highway Alignment".List any four ideal requirements.
6. List the stages of development of roads in India.
7. Define "Traffic density".
8. List the "Highway planning " system.
9. State the various engineering surveys to determine the highway alignment.
10. Write any two On-going highway projects in Tamilnadu.
11. What is "Jayakar committee"?
12. What is CRF?
13. Define NHAI.
14. What is CRRI?

## Part B

1. (i) State the construction steps of Macadam method of road formation.  
(ii) Compare with Telford road construction.
2. How urban roads are classified? Explain.
3. (i) What are the requirements of an ideal highway alignment? Discuss briefly.  
  
(ii) Compare Conventional methods with modern methods in Highway.
4. (i) Discuss in detail about the obligatory points controlling highway alignment.  
  
(ii) Explain I)GIS ii)GPS iii) Remote sensing iv) Total station
5. Define MORTH. Write the importance of MORTH.
6. Draw typical cross sections of urban and rural roads.
7. Write a brief notes on:
  1. Central Road Fund

## 2. Indian Roads Congress

# Unit 2

## Part A

1. What are the three factors affecting the geometric design of a highway?
2. What is stopping sight distance .
3. What are the factors affecting stopping sight distance?
4. Define OSD.
5. Write a short note on overtaking zones.
6. Define road gradient.
7. What is sight distance?
8. What is super elevation? What is its maximum limit as per IRC?
9. What is the use of transition curve?
10. What is deviation angle?
11. What is floating gradient?
12. What are vertical curves?
13. What is headlight sight distance?
14. What is PIEV theory?
15. What is Offtracking?
16. What are the various types of road gradient?
17. Why is grade compensation on horizontal curves provided?
18. Define summit and valley curves.
19. Define emotion time and volition time.
20. Define maximum gradient and limiting gradient

## PART B

1. (i) The speed of overtaking and over taken vehicles are 70 and 40 kmph, respectively on a two way traffic road. If the acceleration of over taking vehicle is  $0.99\text{m/sec}^2$ 
  - a. Calculate safe overtaking sight distance
  - b. Mention the minimum length of overtaking zone and
  - c. Draw a neat-sketch of the overtaking zone and show the position of sign posts.
- (ii) What is overtaking sight distance and intermediate sight distance?
2. (i) Derive the formula for the radius of horizontal curve.
  - (ii) Why do you provide the extra widening on horizontal curves?

## Unit 3 Design of Rigid and Flexible Pavement )

### Part A

1. What do you understand by “pavement” and list the various types of pavement?
2. Explain Rigid and Flexible pavements.
3. What are the factors to be considered in the design of pavements?
4. List any four Flexible pavement types.
5. List any four Rigid pavement types.
6. Draw the cross section of a road pavement structure and name all its parts.
7. Sketch the Flexible pavement and name all its parts.
8. Sketch the Rigid pavement and name all its parts.
9. List the methods of design of “Flexible pavement”.
10. What points should be considered for the design of cement concrete pavement?
11. Explain the following factors
  - a) Radius of resisting section.
  - b) Modulus of sub grade reaction.
  - c) Radius of relative stiffness

### Part B

1. Briefly give the IRC Recommendations useful in the design of cement concrete pavement.
2. Design the pavement of a plain cement concrete 7m wide. Use IRC Recommendations where ever applicable. Adopt expansion joint gap 20mm and Maximum variation in temperature between summer and winter is 40°C. Present Traffic intensity is 1050 veh/day of weight more than 3T. Modulus of reaction of sub base 7 kg/cm<sup>3</sup>. E for concrete = 3x10<sup>5</sup> kg/cm<sup>2</sup>,  $\mu = 0.15$  and radius of contact area is 15 cm and design wheel load is 4100 kg. Temperature differential slab in the region is 17.3, 19.0 and 20.3 for thickness is of 15, 20 and 25cm respectively.( use design chart if necessary)
3. Explain the methods of design of Flexible pavement by CBR method. Discuss the advantage and limitations of CBR method of design.
4. CBR value of sub grade is 4%. Calculate total thickness of pavement. Also calculated the thickness of sub base, base, wearing layer having CBR value of 15%, 80%, 90% respectively. Use IRC accepted CBR curve 'D'. (Use design chart)
5. Design the flexible pavement for construction of new Highway with the following data.  
Number of commercial vehicles as per last count = 1000  
Period of construction = 3 years  
Annual traffic growth rate = 8%  
Category of road = NH, two lane single carriageway  
Design life = 10 years.

## Unit 4

### Part A

1. What are the various tests carried out on bitumen?
2. What are the various tests carried out on aggregates?
3. What are the various tests carried out on soils?
4. Difference between Elongation Index and Flakiness Index.
5. List the desirable properties of Road aggregates.
6. Explain “Water absorption test on Road aggregates”.
7. List different methods of road construction.
8. Explain specific gravity test on aggregates.
9. List the methods of cement concrete pavement constructions.
10. List the methods of Bituminous Road construction.
11. Differentiate between Road tar and Bitumen.
12. List the Field Density of soil – testing methods.
13. Discuss the importance of highway drainage.
14. What are the requirements of a good highway drainage system?

### Part B

1. Write down the construction steps for water bound macadam road. Explain with sketch.
2. Describe the construction steps for surface dressing (or) Bituminous concrete methods of Bituminous construction with sketch.
3. Enumerate the steps in the construction of cement concrete pavement. Explain with sketch.
4. Write short notes on (a) CBR test on soil (b) Field density test on soil.
5. Explain with sketch the following testing methods.  
  
(a) Penetration test on Bitumen (b) Softening point test on Bitumen
6. (a) Explain with neat sketch of impact value test on aggregates.  
(b) Explain with neat sketch of Durability test on Bitumen.
7. Explain with neat sketch of Los angel’s abrasion testing method of Road aggregates.
8. Explain with neat sketches how the subsurface drainage system is provided to lower the water table and control seepage flow.
9. Explain briefly with sketches “Drainage in Hill Roads”
10. Explain briefly “crushing strength” test on Road aggregates with sketches

3. (i) Calculate the stopping sight distance to avoid head on collision of two cars approaching from opposite directions at 100k/hr and 80 k/hr. Make suitable assumptions.

(ii) A highway width 7.5 m of radius 150 m, with a speed of 130 km/hr and the length of wheel base is 7.0 m. Find out the extra widening required.

(ii) Describe the various types of horizontal curves.

4. (i) Under what circumstances summit curves are provided.

(ii) Calculate the stopping sight required to avoid head on collision of two cars approaching from opposite directions at a speed of 75 kmph and 85 kmph. Assume the reaction time of drivers be 2,5 secs. And the coefficient of friction between road surface and tyres be 0.4.

5.(i) What are the objectives of providing transition curves in the horizontal alignment of highway curves? Mention the method of designing transition curve length.

(ii) A valley curve is formed by a descending gradient of 1 in 25 meeting an ascending gradient of 1 in 30. Design the length of valley curve to fulfill both comfort condition for a design speed of 80 kmph ( $c = 0.6 \text{ mtr/sec}^3$ ) and a head sight distance of 127 m for this speed.

6. i) What are the object of extra widening of pavements at horizontal highway curves?. Mention the recommended method of design and introduction in the field.

ii) Calculate the minimum set back distance required on a two lane highway curve radius 400 m so as to provide an intermediate sight distance 180 m , assuming the length of the curve to be greater than SD (200 m)