



**POSTAL
BOOK PACKAGE**

2025

CONTENTS

**CIVIL
ENGINEERING**

Objective Practice Sets

Highway Engineering

1.	Highway Development and Planning	2
2.	Highway Geometric Design	6
3.	Traffic Engineering	25
4.	Highway Materials.....	37
5.	Pavement Design	44
6.	Highway Construction and Maintenance.....	55

Highway Development and Planning

- Q.1** As per the modified classification of road system by the Third Road Development Plan, 1981-2001, the roads in the country under 'Primary System' of road network consist of
- Expressways and National Highways
 - State Highways (SH) and Major District Roads (MDR)
 - Other District Roads (ODR) and Village Roads (VR)
 - All of the above

- Q.2** Which one of the following is the chronological sequence in regard to road construction/design/development?
- Telford, Tresaguet, CBR, Macadam
 - Tresaguet, Telford, Macadam, CBR
 - Macadam, CBR, Tresaguet, Telford
 - Tresaguet, Macadam, Telford, CBR

- Q.3** Match **List-I** with **List-II** and select the correct answer by using the codes given below the lists:

List-I

- Central Road Fund
- Indian Road Congress (IRC)
- Motor Vehicles Act
- Nagpur Road Conference

List-II

- 1939
- 1943
- 1934
- 1st March, 1929

Codes:

- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 4 | 3 | 1 | 2 |
| (b) | 1 | 4 | 2 | 3 |
| (c) | 2 | 3 | 4 | 1 |
| (d) | 1 | 2 | 3 | 4 |

- Q.4** Three new roads A, B and C are planned in a district. The data for these roads are given below:

Road	Length (km)	Number of Villages with Population		
		Less than 2000	2000-5000	More than 5000
A	20	8	6	1
B	28	19	8	4
C	12	7	5	2

Assume utility units, for population

< 2000 ⇒ 1

< 2000-5000 ⇒ 2

> 5000 ⇒ 3

The order of priority for these three roads should be

- A, B, C
- B, C, A
- C, A, B
- C, B, A

- Q.5** According to Nagpur Plan, Indian roads have been classified into how many categories?

- 4
- 5
- 6
- 7

- Q.6** The road length of National Highway by Third Road Plan Formulae, in a certain district in India having its area as 13,400 sq.m will be

- 134 km
- 268 km
- 402 km
- 10988 km

- Q.7** The area of a certain district in India is 15000 sq. km. and there are 10 towns in the district. What will be the total length of Rural Roads (Tertiary system)?

- 12900 km
- 13200 km
- 11900 km
- 12800 km

- Q.8** Under the Nagpur Road Plan, which of the following are NOT relevant in planning the road development programme in a backward district?

- Existing agriculture drainage network of drain canals.
- Existing number of Panchayat unions.
- Existing length of mud-track roads.
- Number of villages with population of 10000

and above.

- (a) 1, 2, 3 and 4 (b) 1, 2 and 3 only
(c) 1, 2 and 4 only (d) 2, 3 and 4 only

Q.9 The length of National Highways as per 3rd 20 year (Lucknow) road plan is given by

- (a) area of the country/75
(b) area of the country/50
(c) area of the country/40
(d) area of the country/25

Q.10 Consider

1. Creation of Central Road Fund
2. National Highway Act
3. Formation of Indian Road Congress
4. Creation of Highway Research Board

The correct chronological order of these events is

- (a) 4, 3, 2, 1 (b) 2, 1, 3, 4
(c) 1, 3, 2, 4 (d) 2, 3, 1, 4

Q.11 In which one of the following location surveys of the road, soil profile sampling is done up to a depth of 1 m to 3 m below the existing ground level?

- (a) Preliminary survey
(b) Final location survey
(c) Construction survey
(d) Material location survey

Directions : Each of the next items consists of two statements, one labelled as 'Statement (I)' and the other as 'Statement (II)'. Examine these two statements carefully and select the answers to these items using the codes given below:

Codes:

- (a) Both Statement (I) and Statement (II) are individually true; and Statement (II) is the correct explanation of Statement (I)
(b) Both Statement (I) and Statement (II) are individually true; but Statement (II) is NOT the correct explanation of Statement (I)
(c) Statement (I) is true; but Statement (II) is false
(d) Statement (I) is false; but Statement (II) is true

Q.12 Statement (I): Level grades may be used in fill sections for roads in rural areas.

Statement (II): On fill sections in rural areas, crowned pavements and sloping shoulders can take care of surface drainage.

Q.13 Statement (I): The 20-year road development plan of India does not take into consideration the length of railway network

Statement (II): Road development should be able to develop independently of the railway development.



Answers Highway Development and Planning

1. (a) 2. (b) 3. (a) 4. (d) 5. (b) 6. (d) 7. (a) 8. (a) 9. (b) 10. (c)
11. (a) 12. (a) 13. (a)

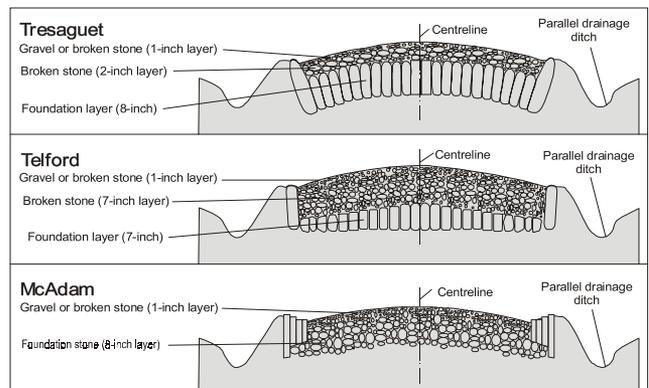
Explanations Highway Development and Planning

1. (a)

According to the Third Road Development Plan in the Lucknow plan (1981-2001), roads should be classified for India as follows:

- (i) Primary system - Expressways and National Highways.
- (ii) Secondary system - State Highways (SH) and Major District Roads (MDR)
- (iii) Tertiary system (Rural road) - other district roads and village roads.

2. (b)



Tresaguet construction was started in 1764 AD in France. Telford construction was started in 1803 AD in London (England). Macadam construction was started in 1815 AD in England. CBR construction was started in 1928 AD in USA.

3. (a)

- Central Road Fund was established in March 1, 1929.
- IRC was established in 1934.
- Motor Vehicles Act was established in the year 1939.
- Nagpur Road Conference happened in 1943.

4. (d)

Assuming utility units, for population

< 2000	= 1.0
< 2000 – 5000	= 2.0
> 5000	= 3.0

Utility per unit length,

For load

$$A = \frac{8 \times 1.0 + 6 \times 2 + 1 \times 3}{20} = 1.150 \quad \dots(\text{iii})$$

For load

$$B = \frac{19 \times 1.0 + 8 \times 2.0 + 4 \times 3}{28} = 1.679 \quad \dots(\text{ii})$$

For load

$$C = \frac{7 \times 1.0 + 5 \times 2.0 + 2 \times 3.0}{12} = 1.92 \quad \dots(\text{i})$$

5. (b)

According to Nagpur Plan, Indian roads have been classified into 5 categories:

- National highways
- State highways
- Major district road
- Other district road
- Village roads

6. (d)

As per 3rd 20 yr plan

Total length of road (km)

$$= \text{maximum} \begin{cases} 4.74 \times (\text{Number of towns} + \text{villages}) \\ \text{Road density} \times \text{Area} \end{cases}$$

We know that,

For 3rd 20 yr plan

$$\text{Road density} = 82 \text{ km}/100 \text{ km}^2$$

$$\text{Given, Area} = 13,400 \text{ sq. km}$$

$$\begin{aligned} \therefore \text{Total length of road} &= \left(\frac{82 \times 13400}{100} \right) \\ &= 10988 \text{ km} \end{aligned}$$

7. (a)

$$\text{NH} + \text{SH} + \text{MDR} + \text{ODR} + \text{VR} = 15000 \text{ km}$$

$$\begin{aligned} \text{Length of MDR} &= \frac{15000}{12.5} = 1200 \text{ km} \\ \text{or} &= 90 \times 10 = 900 \text{ km} \end{aligned}$$

By no. of towns in the state,

adopt 1200 km

$$\begin{aligned} \text{NH} + \text{SH} + \text{MDR} &= 300 + 600 + 1200 \text{ km} \\ &= 2100 \text{ m} \end{aligned}$$

Tertiary system or Rural Roads consists of ODR and VR.

$$\begin{aligned} \therefore \text{Length of Rural Road} &= 15000 - (2100) \\ &= 12900 \text{ km} \end{aligned}$$

8. (a)

Nagpur road plan formula were prepared by radial or star and grid pattern. Villages with population of 501-5000 only were considered. Agricultural area and non agricultural areas were considered. There were no consideration mentioned for existing Panchayat union, existing mud track records or existing drainage network.

9. (b)

$$\begin{aligned} \text{(i) Length of National Highways (NH)} \\ &= \text{Area of the country}/50 \end{aligned}$$

$$\begin{aligned} \text{(ii) Length of State Highways (SH)} \\ &= \text{Area of the state}/25 \\ &= 62.5 \times \text{number of towns in the state} \\ &\quad - \text{Area of the state}/50 \end{aligned}$$

$$\begin{aligned} \text{(iii) Length of the Major District Roads (MDR)} \\ &= \text{Area of the State}/12.5 \\ &= 90 \times \text{number of towns in the state} \end{aligned}$$

(iv) Total length of all categories of roads in a district i.e.

$$\begin{aligned} \text{NH} + \text{SH} + \text{MDR} + \text{ODR} + \text{VR} \\ &= \text{Area of District} \times 0.82 \end{aligned}$$

10. (c)

The correct chronological order:

- (i) Central Road Fund: 1929
- (ii) IRC Formation : 1934
- (iii) National Highway Act: 1956
- (iv) Creation of Highway Research Board: 1973

11. (a)

Soil survey is done as a part of preliminary survey to check the suitability of proposed location and details collected are used for comparative study of alternate projects. In this, sample of soil upto depth of 1 to 3 m below ground level or finished road level is taken.

12. (a)

The main concern in surface drainage is the fast disposal of precipitation on road surface so as to minimize danger to moving vehicles. This is achieved by proper geometric design of the road, i.e. by crowning the carriageway or side cross fall, giving proper cross slope to the shoulders and verges, providing requisite longitudinal gradient.

13. (a)

In Nagpur plan the length of railway track is directly subtracted from the estimated road length of metalled road. But it was later realised that the highway system should be able to develop independently and so in the Bombay Road Plan the length of railway track is not deduced. So both statements are correct at present, and R is correct explanation of A.

