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(6CE5A)

mm. 20

Q.1 (A) Compare first & second 20-year Road Development Plan.

Determine the length of diff. Categories of Road in a state in india by the year 2001. using the third road development formula & following data. Total area of state = 8000 km^2

Total no. of towns as per 1981 Census = 86,

Ans. (A)

S.No.	First 20-year Road Development Plan	Second 20-year Road Development Plan
1.	Target road length was 16 Km per 100 sq.km area.	Target road length was 32 Km per 100 sq.km area.
2.	It gives two formille for calculating the road lengths	In this plan 5 formule were given for calculating the road lengths of each category.
3.	The Nagpur road plan divides the area into two parts i.e. aggricultural and non-agricultural area.	This plan divides the area into three parts i.e. developed, semi-developed and undeveloped area.
4.	No provision for express way was made in this plan	This plan has provided 1600 Km of express way out of purposed national highway

⇒ (i) Express way = 2000 Km

(ii) $NH = \frac{\text{Total Area}}{50} = \frac{80,000}{50} = 1600$ Km

(iii) SH = 3

(a) By Area = 3200 Km

(b) By Area and no. of towns = $62.5 \times 86 - \frac{80000}{50}$

= 3775 Km.

SH = 3775 Km

(iv) MDR

(a) By area, $\frac{80,000}{12.5} = 6400$ Km

(b) By no. of towns,

= 90 × 86

= 7740 Km

So, **MDR = 7740 Km**

(v) ODR + VR = $\frac{80,000 \times 82}{100} - (1600 + 3775 + 7740)$

ODR + VR = 52485 Km

(B) Explain the factors controlling Highway Alignment.

Ans:- The various factors which controll the highway alignment in general are –

(1) Obligatory points
(2) Traffic
(3) Geometric Design
(4) Economy
(5) Other Considerations.

① Obligatory Points :→

These are control points governing the alignment of the highways. These control points may be divided broadly into two categories.

(i) Points through which the alignment is to pass.
(ii) Points through which the alignment shouldn't pass.

② Traffic :→ The alignment should shoot traffic requirements, origin & destination study should be carriedout in the area. And the desired lines be drawn showing the trend of traffic flow.

③ Geometry Design :→

Geometry Design such as gradient radious of curve and right distance also would govern the final alignment of the highway. If straight alignment of highway is aimed at, often it may be necessary to provide very steep gradient.

④ Economy :-

The alignment finalised based on the above factors should be economical. In workingout economics the initial cost, the cost of maintenance and vehicle operations cost should be considered.

⑤ Other Consideration :→ The other considerational factors governing the alignment are drainage consideration, political considerations and hydrological factors. It is also desirable to have a slight bend in the alignment to break the monotony and keep the driver alert.

Q. 2 (A) Explain the California Bearing Ratio test of Soil.

Ans **CBR Test :-** This is a penetration test developed by the California division of highways as a method for evaluating the stability of soil subgrade and other flexible pavement materials.

→ The test result have been correlated with the thickness of highways.

→ The CBR test may be conducted in the laboratory on a prepared specimen or insitu in the field.

Apparatus :→

The laboratory apparatus consists of a cylindrical mould, 150 mm dia & 175 mm height with a base plate and a collar with the cylindrical plunger of 50 mm diameter and dial gauge for measuring expansion on soaking and the penetration value.

PRICEDURE :→

(i) First of all three moulds of soil samples are prepared at optimum moisture content.

(ii) The specimen in the mould is subjected to four days soaking and the swelling & water absorption value are noted.

(iii) The surcharge weight is placed on the top of the specimen in the mould and the assembly is placed under the plunger of the loading machine.

(iv) The load values are noted corresponding to penetration values of 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 7.5, 10.0 and 12.5 mm.

(v) The load penetration graph is plotted.

(vi) About 50 gm of soil is collected from the top 3cm depth of the soil sample for determination of moisture content.

(vii)
$$CBR = \frac{\text{Load (or pressure) sustained by the specimen at 2.5 mm or 5.0 mm penetration}}{\text{Load (or pressure) sustained by standard aggregates at the corresponding penetration level}} \times 100\%$$

(viii) Normally the CBR value at 2.5 mm penetration is higher than that at 5.0 mm is reported as the CBR value of the material.

(ix) However if the CBR value obtained from the test at 5.0 mm then the test is to be repeated for checking.

(x) If the test results again gives same results then the higher value obtained at 5.0 mm penetration is reported as the CBR value.

(xi) The average CBR value of three test specimens is reported to the first decimal place as the CBR value of the material.

(B) Write down the desirable properties of Road aggregates.

Ans. The desirable properties of Road Aggregates are as following —

① Strength :→

The aggregates to be used in road construction should be sufficiently strong to withstand the stresses due to traffic wheel load.

② Hardness :→

The aggregates used in the surface course are subjected to constant rubbing and abrasion. due to moving traffic. This action may be severe in the case of steel tyred vehicles, so the aggregates should be sufficient hard to resist the wear due to abrasive action of traffic.

③ Toughness :→

Aggregates in the pavement are subjected to impact due to moving wheel loads. The impact is severe in the steel tyred vehicles. So the road aggregates should be enough tough to resist impact of vehicles.

④ Durability or Soundness :→

The property of the stone to withsand the adverse action of weather may be called durability or soundness. The aggregates are subjected to the physical & chemical action of rain & ground water the impurities there in & that of atmosphere.

(5) Shapes of Aggregates :→

Aggregates of particular size range may have rounded, cubical, angular, flaky & elongated particles have less strength & durability when compared with cubical, angular, or rounded particle of the some stone.

Rounded aggregates are preferred in cement concrete mix due to better workability.

Angular aggregates are preferred in WMM & bituminous construction due to better interlocking.

(6) Adhesion with Bitumen :→

The aggregates used in bitumenous pavement should have less effinity with water when compared with bitumenous material, otherwise the bitumenous coating on the aggregate will be stripped of in presence of water.