(3 Hours) **[Total Marks: 80**

N. B. i. **Q. No. 1** is **compulsory**
ii. Attempt **any 3** out of **remaining 5**
iii. Support all **theory and numerical** with **neat sketch**

1 **Solve any four.** **(20 M)**

A. Compare Rigid and Flexible pavement on basis of Material, load transfer and cross section.

B. Explain PCU and give the values of PCU for various vehicle category at midblock.

C. What is Overlay? Enlist types of Overlays.

D. Discuss the role of IRC and MORTH.

E. On a highway, due to fog, only 20 meters of road was visible. Find the speed to be permitted for the vehicles to avoid accidents if reaction time is 2 sec and f=0.13.

2 **A.** Design a rigid pavement considering only load stress for wheel load of 7000 kg, tyre pressure 7.5 kg/cm^2, spacing between longitudinal joints is 3.75 m & spacing between contraction joints is 4.2 m. Take E = 3 x 10^5 kg/cm^2, μ = 0.15, e = 1 x 10^{-5}, k = 30 kg/cm^3, flexural strength = 45 kg/cm^2 take minimum F.O.S as 1.1. **(10 M)**

Thickness (cm)	22	24	26	30
Temperature Difference in ^{0}C	14.8	15.6	16.2	16.8

B. Write a note on Highway Drainage. **(05 M)**

C. Explain various types of bearings. **(05 M)**

3 **A.** 1. Find Space Mean Speed, Time Mean Speed, Median Speed, design speed, upper limit & lower limit speed for the following data **(10 M)**

Speed Range (KMPH)	Frequency
0-5	1
5-10	3
10-15	8
15-20	13
20-25	19

Speed Range (KMPH)	Frequency
25-30	16
30-35	11
35-40	9
40-45	2
45-50	1

B. Explain the construction of WBM roads. **(05 M)**

C. What is Camber? Find out the amount of camber to be provided on a 2-lane divided State Highway. **(05 M)**

4 **A.** Derive formula for Overtaking Sight Distance. Also calculate and draw Overtaking zone for 1way road having design speed of 80 kmph. Reaction time is 2.5 sec **(10 M)**

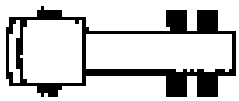
B. Find percentage increase in CSA if rate of growth of traffic increases from 7% to 12%. The traffic after end of construction period is 300 cvpd design life is 10 years, VDF is 2.5 and LDF is 0.75. **(05 M)**

TURN OVER

C. Determine Economical Span for the following data. **(05 M)**

Span	Cost of one pier (Rs.)	Cost of one SS (Rs.)
10	25000	7000
15	28000	13815
20	32500	31000
25	33700	36000

5 A. Calculate ESWL of a RMC Mixer carrying 6 M^3 of concrete. The weight of empty transit mixer along with crew is 4200 kg. Assume that front axle carries only 20% of the total load and the remaining load is equally shared by rear axles. Take the trial depth as 150, 200, 250 mm. Consider center to center spacing of tires is 270 mm & clear gaps is 110 mm. weight of concrete is 2500 kg/M^3. The arrangement of axle is as shown below. **(10 M)**



B. Compare Road signs on the basis of purpose and shape. Also draw 2 examples of each. **(05 M)**

C. A bridge is proposed above a river having discharge of 250 m^3/sec, Lacey's Silt factor is 1.00 find the scour depth when: a) 4 span of 20 m each and b) 3Span of 20 m each are used. **(05 M)**

6 A. Find out the Characteristic deflection for a NH. Take least count = 0.01 mm & k = 2.80 **(10 M)**

Point A	00	46	44
Point B	00	33	39
Point C	05	60	59
Point D	03	42	38
Point E	00	51	46

B. Explain Q-K-V Curve **(05 M)**

C. Fill in the blanks and discuss on the answers. **(05 M)**

i. Abrasion value of aggregate used in pavement should be less then _____

ii. Sum of Flakiness and Elongation Index value as per MORTH for Bituminous concrete road should not increase _____

iii If reading on penetration gauge is 450, the penetration grade of bitumen shall be _____

iv IRC code related to design of rigid pavement is _____

v. In softening point test, heat is increased at the rate of _____ ^{0}C per minute.

_____