(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. Draw cross section of rigid pavement and explain the function of each layer
B. Explain AADT and ADT.
C. Explain types of highway maintenance
D. Discuss on surveys for highway alignment
E. Explain various types of gradients.

2 **A.** Write note on **(08 M)**
i. Modulus of subgrade reaction
ii. ESWL
B. Discuss on Mandatory signs **(06 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 is used. **(06 M)**

3 **A.** Derive formula for Stopping Sight Distance. Also calculate SSD for 1way road having design speed of 80 kmph. Reaction time is 2.5 sec **(08 M)**
B. What is VDF? Give its value for different road widths. **(06 M)**
C. What are the assumptions for economical span? Write steps for calculating economical span **(06 M)**

4 **A.** Compare the following **(09 M)**
i. Running and Journey speed
ii. On-street and off-street parking
iii. At-grade and grade separated intersections
B. Explain the following: **(06 M)**
i. Seal coat and tack coat
ii. Subgrade
iii. Tyre pressure
C. What is Camber? Explain its types. **(05 M)**

5 **A.** Find out the warping stress of 25 cm thick CC pavement with transverse joint at 5 m & longitudinal joint at 3.6 m interval. Take k = 6.9 kg/cm^3, a = 15 cm, temperature difference is 0.6°C /cm slab thickness in day, temperature difference is 0.4°C /cm slab thickness in night. Take E = 3 x 10^5 kg/cm^2, e = 10 x 10^{-6}/°C, l = 87.2 cm. **(10 M)**
B. What is the objective of providing drainage? **(05 M)**
C. Explain various types of bearings. **(05 M)**

6 **A.** Write a detail note on Benkelman beam **(10 M)**
B. Explain 30th HHV **(05 M)**
C. Explain penetration test on bitumen **(05 M)**