

[illegible]

- a) Why is bridge inspection important?
- b) What are the four types of maintenance system adopted for highway bridges?
- c) What are free and tilled bearings?
- d) Describe the general principle of design of masonry arch bridge.
- e) Draw sketches of cantilever and suspension bridges.
- f) Discuss the precautions to be observed for grouting of ducts in prestressed concrete girders.
- g) Discuss the various types of abutments.
- h) What are the advantages of a circular well?
- i) Define Scour Depth.
- j) Write short note on horizontal and vertical clearance required for highways.

### SECTION-B

2. What is the need of investigation for bridges & how the selection of bridge site is done?
3. Determine the design discharge at a bridge side after computing the maximum discharge by :

a) Empirical method

b) Rational method, for the following data :

Catchment area =  $160 \text{ km}^2$

Distance of site from coast = 12 Km

Distance of critical point to bridge site = 16 Km

Difference in elevation between the critical point and bridge site = 96 m

Peak intensity of rainfall = 60 mm/h

Surface of catchment is loam, largely cultivated.

Cross sectional area of stream at MFE at bridge site =  $120 \text{ m}^2$

Wetted perimeter of stream at MFE at bridge site = 90 m

Stream condition- Clean straight banks, Fair condition.

Slope of stream =  $1/500$

4. State how the water way of a culvert is worked.
5. List the loads to be considered in the design of plate girder bridges.
6. What are the requirements of an ideal bearing & discuss neoprene bridge bearing?

**SECTION-C**

7. Design RCC Tee beam to suit following data :

Clear width of roadway = 7.5 m

Span (centre to centre of bearing) = 16 m

L.L = IRC class AA tracked veh.

Average thickness of wearing coat = 80 mm

Concrete mix = M-25 grade

Steel = Fe 415 grade HYSD bars.

Compute the design moments and shears and design the deck slab main girders and cross girders and sketch the typical details of reinforcement.

8. Design a suitable masonry abutment for girder bridge. The angle of internal friction of the retained material is  $45^\circ$ . An approach reinforced concrete slab is provided to the bridge so that the effect of surcharge may be neglected. The angle of friction between soil and masonry is  $30^\circ$ . Height of the abutment below road level is 6.0 m. The positive earth pressure in front of the abutment is to be neglected. Density of masonry is  $2 \text{ t/m}^3$ , density of concrete is  $2.4 \text{ t/m}^3$  & density of soil is  $1.8 \text{ t/m}^3$ .
9. a) Why is corrosion prevention important in maintenance of prestressed concrete bridges?
- b) List the equipment needed for bridge inspection.

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