

(3 hours)

[Total Marks-80]

N.B. (1) Question No.1 compulsory

(2) Attempt any three questions from the remaining five questions

(2) Assume any additional data if necessary and state it clearly

(3) Figures to the right indicate full marks

1. Attempt any four

(a) Explain dead storage and live storage capacity of reservoir

(b) Explain various types of reservoir losses

(c) Explain various types of joints in gravity dam

(d) Explain rock fill types of dams

(e) Explain various types of causeways

2. (a) Following data refer to the non-overflow section of gravity dam. 12

R.L. of top of dam 315m, R.L. of bottom of dam 260m, H.F.L. 312m, Top width of dam 12m, Upstream face is vertical, downstream face is vertical upto 304m, and thereafter downstream face slopes 0.7H to 1 V upto base. Drainage holes are located 8m away from the upstream face. Unit weight of masonry is 23 KN/m^3 , uplift pressure intensity factor 0.5, coefficient of friction between masonry and foundation material 0.8. Consider only forces due to water, uplift, and self-weight. Check stability of dam. Also calculate principal stresses at the base of dam.

(b) Explain the various purposes and types of galleries provided in the gravity dam. 8

3. (a) Explain an elementary profile of gravity dam? Also derive expression for determining the base width of gravity dam. 10

(b) Show that for a constant angle arch dam the most economical centre angle is $133^{\circ}34'$ 10

4. (a) Illustrate with neat sketch the following parts of an earthen dams and state their functions 10

(i) Rock Toe (ii) Horizontal blanket (iii) cutoff (iv) Riprap and berms

(b) Explain flow net with neat sketch. A homogenous earth dam with a filter at its base has the following data:- 10

Height of the dam = 22m; free board = 2m, top width = 6m; U/s slope 2.5:1 and D/s slope: 2:1, Filter length = 20m. Draw a Phreatic line. If $K = 5 \times 10^{-4} \text{ cm/sec}$. Find seepage loss per m length of the dam.

[Turn Over]

5. (a) What is meant by energy dissipators? Discuss the various methods used for energy dissipation below spillways. 10
- (b) Design a suitable section for the overflow section of concrete gravity dam having the d/s face sloping 0.7H to 1 V. The design discharge is 6000 cumecs, height of spillway above river bed is 60m, and effective length of spillway is 50m. 10
6. a) Describe with neat sketch working of siphon aqueduct 5
- (b) A small bridge is proposed to be constructed across an alluvial stream carrying a discharge of $350 \text{ m}^3/\text{sec}$. Assuming the value of silt factor = 1.1 Determine normal scour depth when the bridge consist of two spans of 35 m each. 5
- (c) Explain linear waterway, afflux and scour depth in small bridge design 5
- (d) Distinguish between silt excluder and silt ejectors 5
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