

P2101

B.E. (Semester - II)
DAMS AND HYDRAULIC STRUCTURES
(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate answer books.*
- 2) Answer any three questions from each section.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right side indicate full marks.*
- 5) Use of Calculator is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What factors govern the selection of type of dam? [4]
b) Write short notes on : [4]
 i) Economical height of dam and
 ii) Arch dams
c) Describe in detail 'Instrumentation in dams'. [8]

OR

- Q2)** a) Enlist the various I.S. guidelines with reference to the following : [8]
 i) Dam safety and
 ii) Dam design.
b) What are the salient features of an arch dam and different types of arch dams? Give three examples of arch dam? What is meant by 'best central angle' of the arch dam and what is its value? [8]

P.T.O.

Q3) a) A gravity dam is 10 m high, has a top width of 1 m, base width 9 m and the front face is vertical. Assume unit weight of concrete is 2400 kg/m^3 and the water is stored upto the top of the dam. Take density of water as 1000 kg/m^3 . Determine : [12]

- i) Stability against overturning.
- ii) Compressive stress and principal stress at the toe and heel
- iii) Shear stress at the toe and heel of the dam.

Consider only self weight of dam and water pressure.

b) With a neat sketch of gravity dam, explain any three forces and their effect on dam. [6]

OR

Q4) a) Differentiate between the following : [10]

- i) High and low dam
- ii) Overflow and non-overflow dam

b) Derive the formula for elementary profile of a gravity dam. [8]

Q5) a) Explain various causes of failure of an earth dam. [8]

b) Explain various types of rockfill dams. [8]

OR

Q6) a) Determine the factor of safety for the slip surface shown in Fig. 1 for a sudden drawdown condition with the following properties of the embankment material : [8]

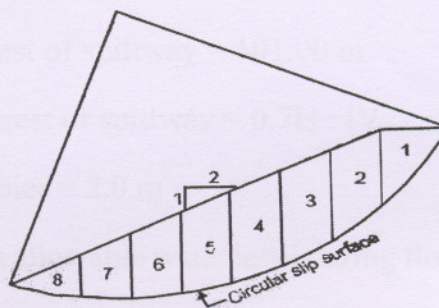


Fig. 1 Slip circle

- i) Saturated weight = 21.0 kN/m^3
- ii) Submerged weight = 11.0 kN/m^3
- iii) Cohesion = 24.5 kN/m^2

- iv) Angle of internal friction, $\phi' = 35^\circ$.
- v) Angle α , arc length, and areas of different slices are given in Table 1.

Table 1 : Data

Slice	Angle α (degrees)	Arc length (m)	Area of slice (m ²)
1	54.5	6.70	12.26
2	41	3.80	19.51
3	31	3.50	31.37
4	22	3.35	20.90
5	13	3.05	19.97
6	5	3.05	16.72
7	-3.5	3.05	12.08
8	-13	4.30	6.69

- b) Explain the various design principles of an earth dam. [8]

SECTION - II

- Q7) a)** Design an Ogee shape gated spillway for the following data : [10]

- i) Maximum design flood = 1200 cumec
- ii) Average river bed level = 0 m
- iii) R.L. of crest of spillway = 101.00 m
- iv) Slope of crest of spillway = 0.7H : IV
- v) Width of pier = 2.0 m
- vi) Maximum allowable water level during flood = 105.00 m

Assume number of span as 7, clear way of each span as 10.0 m and $k_a = 0.1$ and $K_p = 0.01$.

- b) Draw proportionate and neat labeled sketch of typical diversion headwork showing its six important components. Write functions of any four components. [8]

OR

- Q8) a)** Draw proportionate and neat labeled sketches for the following energy dissipators. [6]
- i) Roller bucket and
 - ii) Ski-jump bucket
- b)** Explain briefly Bligh's theory of seepage with sketch. State its four limitations. [6]
- c)** Write brief notes on : [6]
- i) Safety and maintenance of spillway gates.
 - ii) Differences between weirs and barrages.
- Q9) a)** Design a channel using Kennedy's theory carrying a discharge $30 \text{ m}^3/\text{s}$ with critical velocity ratio and Manning's constant equal to 1.0 and 0.0225 respectively. Assume that the bed slope is equal to 1 in 5000. [10]
- b)** State various types of canal falls and explain any one type with the help of a sketch. [6]

OR

- Q10) a)** State the importance of cross drainage works? State the criteria of selection of appropriate type of cross drainage work. [6]
- b)** State merits and demerits of canal lining. [5]
- c)** Discuss briefly various types of canal outlets. [5]
- Q11) Write short note on :** [16]
- a) Objectives and methods of river training.
 - b) Purpose and measures of bank protection.

OR

- Q12) a)** Explain Storage Hydropower plant and state its main components. [6]
- b)** Explain the importance of following components of an hydro-power plant with neat sketches. [5]
- i) Surge tank and
 - ii) Draft Tube
- c)** Write a short note on run - of - river plant. [5]

