B. Tech.

(SEM. VIII) EXAMINATION, 2006-07
WATER RESOURCES ENGINEERING – II

Time : 3 Hours] [Total Marks : 100

Notes : (i) Attempt all questions.
(ii) Each question carries equal marks.
(iii) Be precise in your answer.
(iv) Assume any missing data suitably.

1 Attempt any four parts of the following : 5×4=20

(a) A horizontal impervious floor of 20 m length is provided with a cutoff of 4 m depth at its downstream end (Fig. P-1(a)). Determine analytically the uplift pressure at points E and D, and also the exit gradient, if the head causing seepage is 2 m.

(b) What are the limitations of Bligh's theory in the design of impervious floor for sub-surface flow?

VB-0045] 1  [Contd...
(c) What are different types of hydraulic structures constructed to regulate a canal? Enumerate the necessity of a canal fall provision and identify its proper location.

(d) What is cistern element in a fall? Give various expressions for its deviations.

(e) What are "roughening devices"? Discuss their use in "falls construction". What roughening devices would you recommend for a flumed straight glacis fall?

(f) Write a short note on canal escape and bed bars.

2 Answer any two parts of the following: \[10 \times 2 = 20\]

(a) Describe with the help of neat sketches various types of cross-drainage works. On what various factors the selection of suitable type of cross-drainage works depend.

(b) (i) Following data were collected from a syphon aqueduct:
- Diameter of the barrel (single) = 3 m
- Length of the barrel = 90 m
- Discharge through the barrel = 25 cusecs
- Friction factor (in Darcy-Weisbach formula)
- Coefficient of bend loss = 0.013
  (2 bends) = 0.10
- Coefficient of head loss in expansion at outlet = 0.20
- Coefficient of head loss in contraction at inlet = 0.10

Determine afflux. Neglect velocity head in drainage channel.

(ii) What are different types of headworks on a canal? Enumerate the difference between a weir and a barrage. What are different causes of failure of a weir?
(c) (i) What do you understand by launching apron? How is it designed?
(ii) Describe, with the help of sketches, the working of a silt excluder.

3 Attempt any two parts of the following: \(10 \times 2 = 20\)
(a) Enumerate the different methods which are used for controlling and training rivers and describe any one of these methods in detail. Also discuss the circumstances under which a particular method of river training is to be adopted.
(b) (i) Define the following:
   Surcharge storage, valley storage, safe yield, secondary yield, density currents and trap efficiency.
(ii) What do you understand by mass-inflow curve? How is it prepared?
(c) (i) Write a short note on reservoir sedimentation. How do you estimate the probable life of a reservoir?
(ii) What is flood routing? Explain the basic flood routing equation and outline its method of solution.

4 Attempt any two parts of the following: \(10 \times 2 = 20\)
(a) Design a practical profile a gravity dam of stone masonry. The following data are given:
   R. L. of base of dam = 1450 m
   R. L. of H.F.L. = 1480.5 m
   Specific gravity of the masonry = 2.4
   Safe compressive stress for masonry = 120 tonnes/m²
   Height of waves = 1 m
(b) (i) Discuss in brief various modes of failure of a gravity dam.
(ii) What do you understand by galleries and shafts and why are they provided in gravity dams?
(c) A masonry dam 10 m high is trapezoidal in section with a top width of 1.0 m and bottom width of 8.25 m. The face exposed to water has a batter of 1 : 10. Test the stability of the gravity dam. Assume unit weight of masonry as 2400 kg/m$^3$, unit weight of water as 1000 kg/m$^3$ and permissible shear stress of joint = 14 kg/cm$^2$.

5 Attempt any two parts of the following: 10×2=20
(a) Write a short notes on each of the following spillways with neat sketch:
(i) Straight drop spillway (ii) Ogee spillway (iii) Side channel spillway (iv) Chute spillway or through spillway
(b) Enumerate the various types of energy dissipation devices which may be recommended below spillway in relation to the relative position of tail water rating curve and jump height rating curve.
(c) The load on a hydel plant varies from a minimum of 10,000 kW to a maximum of 35,000 kW. Two turbo-generators of capacities 22,000 kW each have been installed. Calculate: (i) total installed capacity of the plant (ii) plant factor (iii) maximum demand (iv) load factor (v) utilization factor.