

16428(J)

**M. Tech 2nd Semester Examination**

**Dam Engineering**

**WRE-113**

**Time : 3 Hours**

**Max. Marks : 100**

*The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.*

**Note :** Attempt five questions in all, select one question from each sections A, B, C and D. Section E is compulsory.

**SECTION - A**

1. (a) Explain in detail the various forces causing instability in a gravity dam. How such failures can be prevented. Give suitable remedial procedures.  
(b) What is meant by the elementary profile of a gravity dam and how it is deduced? What should be the maximum depth of elementary profile of a dam if the safe limit of stress on the masonry should not exceed  $1500 \text{ kN/m}^2$ ?  
(2×10=20)
2. What do you understand by Arch dams? Discuss different types of arch dams available. Briefly explain the different forces acting on an arch dam. (20)

**SECTION - B**

3. What are the criteria adopted for designing earthen dams? Also give an elementary idea to select a suitable preliminary section for such dams. (20)
4. How seepage is controlled in earthen dams? Give various remedial procedures adopted to control seepage through embankments and foundations in detail. (20)

**[P.T.O.]**

**SECTION - C**

5. How rock fill dams are constructed? Discuss in detail principal methods of construction and compaction of such dams. (20)
6. What do you understand by buttress dams? Why these dams are built? Explain different types of buttress dams. Also give the importance of master curve. (20)

**SECTION - D**

7. (a) What is an ogee spillway and how it is designed? Draw a neat sketch of an ogee profile showing various zones in it.  
(b) Critically examine the statement "A Spillway is a safety valve in a dam". (2×10=20)
8. Explain the importance and working of any two in detail.  
(a) Rectangular gates.  
(b) Drum gates.  
(c) Dropping shutters. (2×10=20)

**SECTION - E**

9. Reply the following (tick the right one):  
(1) The vertical component of the earthquake wave, which produces adverse effects on the stability of a dam, is, when it is acting in;  
(a) Upward direction  
(b) Downward direction  
(c) Both (a) and (b)  
(d) None of them  
(2) A reservoir, extending 20 km upstream and having a design wind velocity of  $100 \text{ km/h}$ , should be provided with a free board of: -  
(a) 1.2 m (b) 1.6 m  
(c) 2.5 m (d) 3 m

- (3) The bottom portion of a concrete or a masonry gravity dam is usually stepped, in order to
- Increase the overturning resistance of the dam
  - Increase the shear strength at the base of the dam
  - Decrease the shear stress at the base of the dam
  - None of them
- (4) Pure clayey soils are generally not preferred for the central impervious cores of zoned type of earthen dams, because:-
- Clays are highly impervious
  - Clays are highly pervious
  - Clays are susceptible to cracking
  - None of them
- (5) Provision of horizontal berms at suitable vertical intervals may be provided in the downstream face of an earthen dam, in order to:
- Allow the movement of cattle
  - Allow the inspection vehicles to move
  - Reduce the erosion caused by the flowing rain water
  - None of them
- (6) On moderate foundations, and particularly in seismic areas, the type of dam which can preferably be considered for construction is:
- Masonry gravity dam
  - Earthen dam
  - Buttress dam
  - Arch dam

[P.T.O.]

- (7) The spillway, which can be adopted with ease on gravity as well as earthen dams, is:
- Ogee spillway
  - Chute spillway
  - Both ogee as well as chute spillway
  - None of them
- (8) An ungated spillway starts functioning, as soon as the water level in the reservoir, crosses the
- Maximum reservoir level
  - Minimum reservoir level
  - Maximum conservational level
  - None of them
- (9) The temperature stresses, producing worst effects in the design of arch dams, are caused by :
- Rise of temperatures
  - Fall of temperatures
  - Both (a) and (b)
  - None of them
- (10) Which of the following is incorrect about buttress dam?
- It requires less construction material than a solid gravity dam of the same height
  - It is less susceptible to deliberate damage or sabotage
  - Ice pressure is not significant, because ice slides over the sloping deck
  - The factor of safety is usually greater than for a gravity dam.

(10×2=20)