Question 1 (3 Marks)

Choose the most appropriate answer from the following:

1- Development of tensile stresses in a concrete or masonry gravity dam are usually not allowed, because it may lead to development of tension cracks, ultimately causing failure of the structure, by:
   (i) excessive seepage
   (ii) excessive compressive stresses
   (iii) excessive tensile stresses
   (iv) none of the above

2- In a concrete gravity dam, with a sloping upstream face, the resisting force is provided by the:
   (i) weight of the dam
   (ii) weight of the water supported on the upstream slope
   (iii) both (i) and (ii)
   (iv) none of the above

3- The horizontal component of an earthquake wave, producing instability in a dam is the one, which acts:
   (i) towards the reservoir
   (ii) towards the dam
   (iii) both (i) and (ii)
   (iv) none of the above

4- In computing the spillway capacity of high ogee spillways, the velocity head is usually:
   (i) very large, and hence can not be neglected
   (ii) very small, and hence neglected
   (iii) neither (i) nor (ii)

5- When sand and gravel foundation strata is available at a proposed dam site of moderate height, the dam may be of the type:
   (i) earthen dam or rockfill dam
   (ii) double arch dam
   (iii) masonry gravity dam
   (iv) concrete gravity dam

6- The "dead storage" in a dam reservoir, is the available volume for collection of silt and sediment, between:
   (i) bed level of the reservoir and minimum of reservoir level
   (ii) bed level of the reservoir and the silt level in the reservoir
   (iii) bed level of the reservoir and the normal pool level
   (iv) none of the above
Question 2

A. State various kinds of dams and their classifications according to the material used for construction, hydraulic designs and use.

B. Mention the factors, which are governing the selection of a particular type of dam.

C. State the different classifications of Forces acting on gravity dam.
Examine the stability of this dam section at the base against overturning and sliding, also state whether tension is developed anywhere or not. Assume the following:

- Tail water depth is 6 m
- Friction is 0.8, $\gamma_c = 24$ KN/m$^3$ and $\gamma_w = 10$ KN/m$^3$
**Question 4**

(3 Marks)

Determine the total head over the crest for an Ogee spillway as shown in the Figure, the design discharge for the spillway is 9000 cumecs. The height of the spillway crest is kept as at 218.0 m. The average bed level at the site is 118.0 m. The spillway length consists of 7 spans having a clear width of 10 m each. The thickness of each pier may be taken to be 2.5 m. The coefficient of discharge may be assumed to be 2.2. (Assume $K_p = 0.01$ and $K_a = 0.1$)