(v)   Tidal power plants works in which type of topography?

    a.   Hilly terrain   b.   Coastal areas

    c.   Desert plains   d.   River basins

(vi)   Which type of head race tunnel is most economical and stable?

    a.   Circular   b.   D-shaped

    c.   Horse shoe shaped   d.   None of the above

(vii) In context with tunneling, the term "Q-value" is associated with which factor?

    a.   Rock hardness   b.   Tunnel cross-section

    c.   Tunnel slope

    d.   Underground water outlets

(viii) Penstock material can be of

    a.   Steel   b.   Concrete

    c.   Fiber   d.   All of above

(ix)   What is the position of surge shaft in any closed hydraulic structure containing reservoir, head race tunnel, penstock?

    a.   At the end of the penstock

    b.   At the intake structure of reservoirs

    c.   Just before penstock starts

    d.   Anywhere in the closed hydraulic structure

(x)   Hygrometer is a device used to measure

    a.   Atmospheric pressure

    b.   Humidity

    c.   Evapotranspiration

    d.   Irrigation water requirements.   (10×2=20)

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, selecting one question from each section A, B, C, D. Section E is compulsory.

SECTION - A

1.   Why it is necessary to predict the future load demand? What are the methods of load forecasting?   (20)

2.   How can we predict the power potential of a stream? What are various construction practices to increase the power potential of stream?   (20)

SECTION - B

3.   How can we classify hydropower plants? What are the various parameters of classification? Give details.   (20)

4.   (a)   What is submersible Power Station? Also draw a neat sketch.   (15)

    (b)   A 100MW reversible pump turbine has to work under the head of 400 m. Suggest a suitable specific speed and running speed for the machine.   (5)

SECTION - C

5. Arrange the following components of hydro power project in sequence from upstream to downstream. **Penstock, water intake structure, head race tunnel, surge shaft, power house.** Explain each component and draw a sketch to show all components joined in sequential order. (20)

6. A penstock pipe 750 m long, takes off from the reservoir and feeds water to the turbine, the level of which is 220 m below the reservoir water level. The first 250 m length of the penstock has a cross-sectional area of 5 sq m and rest has the area of 3 sq m. the steady state discharge is 9 cumec. If the turbine gates are closed in a period of 4.5 seconds completely at a uniform rate, compute the water hammer pressure developed? Use allievi charts and neglect the friction effects. (The Allievi charts are given in Fig. 1). Assume the wave velocity to be 1000 m/s. (20)
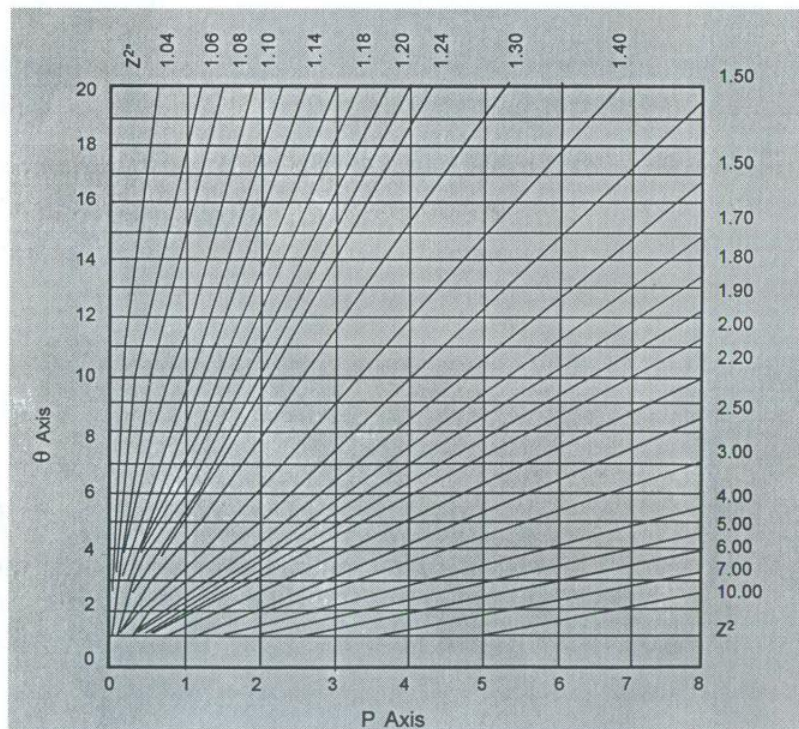

Fig. 1. Allievi's charts

SECTION - D

7. Describe various types of turbines. Explain merits and demerits of all of them. Discuss the suitability of turbines with respect to medium heads, high heads and very high heads? (20)

8. What are Draft tubes? What are different types of draft tubes and what are their usages? Describe about the efficiency of the draft tubes? Discuss the compatibility of various types of draft tubes with respect to different turbines? (20)

SECTION - E

9. Reply the following (tick the right one)

(i) Micro hydel plants are those which have the maximum generating capacity upto

 a. 5 MW   b. 20 MW

 c. 50 MW   d. 100 MW

(ii) Koyna Hydroelectric project (largest hydel project in India) has the generating capacity of

 a. 1680 MW   b. 1960 MW

 c. 2280 MW   d. 2400 MW

(iii) Which one is the type of impulse turbine?

 a. Tube turbine   b. Straflo turbine

 c. Pelton turbine   d. Propeller turbine

(iv) Strorage reservoir for the hydel project is required

 a. Where the inflow is uneven over the year

 b. To rise the head value

 c. To generate pressure

 d. To save the structure from water hammer