Form A: Paper-setting Blank

Ref. No. EX/PE/T/324/2018(Old)

B. Power Engineering 3rd yr. 2nd Sem . . . Examination, 2018 (old)

Subject: **Hydro Power Generation**

Time: Three hours

Full marks: 100

Answer any Five Questions

No. of questions		Marks
1	Why surge tanks are essential for long penstocks? Rated head of a hydro electric power plant is 75m. The plant is on a canal and the discharge from the dam is totally controlled by the irrigation department. The water released from the dam during the 12 months is given below. Draw the power duration curve. Given discharge in cumec. Jan 1.15 Feb 0.0 March 0.58 April 8.17 May 24.6 June 17.1 July 7.9 Aug 11.3 Sept 10.7 Oct 4.9 Nov 0.02 Dec 0.0	5+15
2.	What are the different loads considered while designing a dam? What is meant by buttress dam? Discuss its types. A hydro electric plant uses a penstock of ID 1200mm. The pressure gauge fitted at the end of the penstock close to the turbine recorded a pressure of 17.6 kg/cm^2. The design stress and efficiency of the joint are 1020 kg/cm^2 and 85% respectively. Considering a possibility of increase in the pressure due to transient conditions is 20%, calculate the approximate wall thickness of the penstock required.	5+5+10
3.	What is meant by economical diameter of a penstock? Discuss the graphical method of determining economical diameter of a penstock. What are advantages and disadvantages of embedded type penstock? What do you mean by hydrological cycle?	3+8+5+4
4.	A penstock carries water at 17.6kg/cm^2 of pressure with a possibility of 15% increase in pressure due to valve operation. The internal diameter of the penstock is 1.2m and design stress of penstock material is 1020kg/cm^2. Calculate the wall thickness of the penstock required. Why anchor blocks are used for long penstocks? Based on what criteria penstocks are selected? What are the main components of a tubular turbine?	10+3+3+4
5.	What are the different loads considered while designing a dam? What do you mean by a mass curve of runoff? How can you determine the storage capacity of a reservoir with the help of a constant or variable demand? What do you mean by cavitation?	14+2+2+2

6.	Discuss the different types of embankment dams. A Kaplan turbine produces 50,000bhp under a head of 20m with an overall efficiency of 90%. The ratio of hub to tip-to-tip is 1:3, flow ratio is 0.5 and speed ratio as 2.0. Estimate diameter of boss and turbine speed.	10+10
7.	What type of turbine would you prefer for low head plants? What do you mean by water hammer? How it is prevented for a hydro electric plant? The cost of loss of energy due to friction in the penstock against various diameter at the prevalent rate of sale of energy is given below: Cost (x 10^4 Rs.): 7 5 3 0.7 0.2 Diameter (m): 0.6 1.2 2.4 4.5 5.5 The total annual maintenance cost of a penstock to various diameter is given below: Cost (x 10^4 Rs.): 0.5 1.6 3.4 5.8 Diameter (m): 1.1 3.0 5.0 7.0 Find the optimum diameter of the penstock by graphical method.	2+2+2+14