B.E. POWER ENGINEERING THIRD YEAR FIRST SEMESTER EXAM 2024

SUBJECT: **HYDRO POWER GENERATION**

Time -3 hours   Full Marks 100

	CO1 (25 Marks)	Marks
1.(a)	Discuss the relative merits and demerits hydro power as compared to other power sources	5
(b)	In order to estimate the monthly evapouration loss from a small reservoir, daily observation were taken and it was observed thet that the monthly value of pan evapouration for the month of May was15 cm. The reservoir area on 1st May was 2 sq km and it reduced to 1.6 sq km by the end of May. Find out the volume of evapourationif class A land pan was used for observations. (Take pan coefficient =0.7)	20
	OR	
	Name the devises to measure rainfall. A catchment area is divided into four sub-basins. The rainfall data recorded by each sub-basins is given below. Calculate the average annual precipitation in cm over the catchment by (i) arithmetic average method and (ii) Theissen polygon method (explaining the Thession polygon method). For Thession polygon method the areas are estimated as 52 sq km, 77 sq km, 35 sq km and 68 sq km respectively corresponding to the rain gauge station no.. Also calculate the error using arithmetic average method. St. no. 1 2 3 4 Average rainfall(mm) 124 114 126 99	4+16
	CO2 (25 Marks)	
2 (a)	What do you mean by hydrological cycle? What do you mean by a mass curve of runoff?	5+5
(b)	Suppose that for Horton's equation are f_0=3 7.62cm/h, f_c=1.45 cm/h, and k=4.182/h. Determine infiltration rate and cumulative infiltration after 0, 0.5, 2.0, 1.5 and 2 hours. Plot both as function of time. Plot the infiltration rate as a function of cumulative infiltration. Assume continuously ponded condition	15
	OR	
	What is hydrograph? Show its different limbs with a neat sketch. Write different methods for direct and indirect measurement of run-off with brief description. How to determine the storage capacity of a reservoir with the help of constant or variable demand?	2 7 6
	CO3 (25 marks)	
3(a)	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 Feb March April May June July Aug Sept Oct Nov Dec 1.15 0.0 0.58 8.17 24.6 17.1 7.9 11.3 10.7 4.9 0.02 0.0	16

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	OR What do you mean by economic diameter of a penstock? Discuss the graphical method to determine economic diameter of the penstock.	4 12
(b)	Why anchor blocks are used for long penstock? Based on what criteria penstocks are selected? What are the advantage and disadvantages of embedded type penstock?	3+3+ 3
	CO4 (25 marks)	
4 (a)	Describe the criterial to select a site for hydroelectric power plant How the hydro power plants are classified? State advantage and disadvantage of pump storage plant.	5+3+ 5
(b)	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/cm². The design stress and efficiency of the joint are 1020 kg/cm² 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. **OR** Why surge tanks are essential for long penstock? Discuss different type of surge tanks. Write short notes on bulb and tube turbine.	12 3+5+ 4