Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

Course: POWER PLANTS **Semester: VIII**
Program: B. Tech Mechanical Engineering **Time: 03 hrs.**
Course Code: MHEG 453 **Max. Marks: 100**

SECTION A

S. No.		Marks	CO
Q 1	Explain the flashed steam system with flow and T-s diagrams. How is binary cycle system different from it?	**5**	**CO3**
Q 2	Draw layout of hydroelectric power plant and explain the basic elements of the plant.	**5**	**CO4**
Q 3	Illustrate the following terms with reference to a nuclear reactor: (i) Moderator (ii) Coolant (iii) Control rods (iv) Reflector.	**5**	**CO1**
Q 4	Describe characteristics; construction and working of the Benson high-pressure drum less boiler with the help of neat diagram.	**5**	**CO2**

SECTION B

Q 5	A textile factory requires 10 t/h of steam for process heating at 3 bar saturated and 1000kW of power, for which a back pressure turbine of 70% internal efficiency is to be used. Find the steam condition required at inlet of the turbine.	**10**	**CO4**
Q 6	Draw flow duration and mass curve and explicate its merits and demerits.	**10**	**CO2**
Q 7	The following data is applied for a hydro-electric power station : Catchment area ------ ----------100 sq. km; Annual rain fall ------ ----------1200 mm; Available head ---------- 220 m; Load factor --------- ---------- 45%; Yield factor to allow for run-off and evaporation loss ----- 55%; Power plant efficiency---- ----------72%. Calculate (i) average power produced (ii) Capacity of the power plant.	**10**	**CO3**
Q 8	A boiler produces 2000 kg of dry and saturated steam per hour at 10 bar and feed water is heated by an economizer to a temperature of 110^0 C. 225 kg of coal of a calorific value of 30100 kJ/kg are fired per hour. If 10% of coal remains Unburnt, find the thermal efficiency of the boiler and boiler and grate combined. **OR** Explain the effect of intercooling and reheating in a gas turbine plant with line and	**10**	**CO 4**

	T-S diagrams.	**10**	**CO 3**

SECTION-C

Answer any two questions

Q 9

The run off data of a river at a particular site is tabulated as below.

Month	Mean discharge (millions of cu.m.)	Month	Mean discharge (millions of cu.m.)
January	30	July	80
February	25	August	100
March	20	September	110
April	0	October	65
May	10	November	45
June	50	December	30

(a) Draw the hydrograph and find the mean flow.
(b) Draw flow duration curve.
(c) Find the power developed if the head available is 90 m and overall efficiency of generation is 86 per cent. Assume each month of 30 days.

20 **CO 5**

Q 10

Steam at 40 bar, 500^0 C flowing at the rate of 5500 kg/h expands in a high-pressure turbine to 2 bar with an isentropic efficiency of 83%. A continuous supply of steam at 2 bar, 0.87 quality and a flow rate of 2700 kg/h is available from a geothermal energy source. This steam is mixed adiabatically with the h.p. turbine exhaust steam and the combined flow then expands in a low-pressure turbine to 0.1 bar with an isentropic efficiency of 78%. Determine the power output and the thermal efficiency of the plant. Assume that 5500kg/h of steam is generated in the boiler at 40 bar, 500^0 C from the saturated feed water at 0.1 bar. Had the geothermal steam not been added, what would have been the power output and efficiency of the plant? Neglect pump work.

20 **CO 5**

Q11

A Morse test on a 12 cylinder, two-stroke compression – ignition engine of bore 40 cm and stroke 50 cm running at 200 rpm gave the following readings.
The output is found from the dynamometer using the relation bp= WN / 180
Where W, the brake load is in Newton and the speed, N is in rpm. Calculate ip, mechanical efficiency and bmep of the engine.

Condition	Brake load (Newton)	Condition	Brake load (Newton)
All firing	2040	7th cylinder	1835
Ist cylinder	1830	8th cylinder	1860
2nd cylinder	1850	9th cylinder	1820
3rd cylinder	1850	10th cylinder	1840
4th cylinder	1830	11th cylinder	1850
5th cylinder	1840	12th cylinder	1830

20 **C04**

	6th cylinder	1855	All firing	2060		