Name: **Enrolment No:**	**UPES SAP ID:**

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May, 2021

Course: Power Plant Engineering **Semester: VIII**
Program: B.Tech – Mechanical engineering **Time: 3 hours**
Course Code: MECH4013P **Max. Marks: 100**
No. of Pages: 02

Note:

1. The paper consists of 3 sections A, B and C.
2. For Section A, type your answers in the browser directly
3. For Sections B and C, scan and upload your answers.
4. In Section C, Q12 has internal choice.

Section A

Q1.	Explain the reason, why are the economisers tubes often finned or gilled on the gas side?	**5**	**CO2**
Q2.	Define plant Use factor and plant capacity factor. Also explain how these factors affecting the design and operation of the power plant.	**5**	**CO1**
Q3.	The use of regenerative feed water heating increases the capital cost but reduces the operating cost of a steam power plant. Explain	**5**	**CO2**
Q4.	Enumerate the factors on which the performance of a pulverizer depend.	**5**	**CO2**
Q5.	A 300 MW thermal power station is to supply power to a system having maximum and minimum demand of 240 MW and 180 MW respectively in a year. Assuming the load duration curve to be straight line, estimate the (a) load factor, (b) capacity factor	**5**	**CO3**
Q6.	Why is the bulk temperature of the condensate less than the saturation temperature?	**5**	**CO1**

Section B

Q7.	Discuss the effect of intercooling and reheating in a gas turbine plant.	**10**	**CO2**
Q8	Explain the operation of a travelling grate stoker with the help of neat sketch.	**10**	**CO3**
Q9	A simple steam power cycle uses solar energy for the heat input. Water in the cycle enters the pump as a saturated liquid ay 40° C, and is pumped to 2 bar. It then evaporates in the boiler at this pressure, and enters the turbine as saturated vapour. At the turbine exhaust the conditions are 40 °C and 10% moisture. The flow rate is 150kg/h. Determine (a) the turbine isentropic efficiency, (b) the net work output, (c) the cycle efficiency, and (d) the area of the solar collector needed if the collectors pick up 0.58 kW/m^2	**10**	**CO4**
Q10	Coal with composition by weight: carbon 75%, hydrogen 5%, oxygen 5%, moisture 8% and ash 7%, is burnt with excess air. The Orsat analysis of the resulting flue gas shows CO_2 9.09%, O_2 10.55%, CO nil and the balance nitrogen. Determine the weight of air used per kg of coal and the percentage of carbon which is not burnt.	**10**	**CO2**
Q11	Enlist the various losses taking place in a steam turbine.	**10**	**CO4**

Section C			
Q12	A steam turbine is to operate between 140 bar, 560 °C and 0.075 bar. The maximum blade velocity is 320 m/s and the nozzle efficiency in all the stages is 0.90. Nozzle angles will be 15° for impulse stages and 25° for reaction stages. All the stages operate close to the maximum efficiency. Estimate the number of stages required for each of the following arrangements: (a) All simple impulse stages (b) All 50% reaction stages (c) A two-row Curtis stage followed by simple impulse stages. (d) A two-row Curtis stages followed by reaction stages. **OR** In a reheat cycle, the initial steam pressure and the maximum temperature are 150 bar and 550 °C respectively. If the condenser pressure is 0.1 bar and the moisture at the condenser inlet is 15%, and assuming ideal processes, determine: a. The reheat pressure b. The cycle efficiency c. The steam rate	**20**	**CO3**