THEORY EXAMINATION – JULY 2021		TIME – 4 Hrs.
B.TECH - ME	**SEMESTER - IV**	**M.M. - 75**

PAPER ME-204	SUBJECT– STEAM GENERATION AND POWER

INSTRUCTIONS TO BE FOLLOWED

- **The candidates will be required to attempt All questions in Part-A and Part-B (Compulsory Sections). Attempt any four questions from Part-C selecting at least one from each unit.**
- **Allotted time for examination is 4 hours that includes time for downloading the question paper, writing answers, scanning of answer sheets and uploading the sheets on the Attendance Sheet Cum Answer Sheet Uploading google form.**
- **The PDF files should be saved as Roll No. and Subject Code.**
- **Maximum Page Limit should be 36 (Thirty Six) for attempting the question paper on A4 sheets which could be downloaded and printed from the sample sheets given in the UIET Website.**
- **Over-attemptation should be avoided.**
- **Handwriting should be neat and clean and diagrams should be clear and contrasted.**
- **The candidate should not write their Mobile No. otherwise Unfair Means Case will be made.**
- **While attempting the paper, the candidate will use blue/black pen only.**
- **Before attempting the paper, the candidate will ensure that he/she has downloaded the correct question paper. No complaint for attempting wrong question paper by the candidate will be entertained.**
- **Candidate must ensure that he/she has put his/her signature on each page of the answer sheet used by him/her. Answer sheet without the signature of the candidate will not be evaluated.**
- **Attempt parts A, B & C separately. Do not inter-mix them. Write neatly & mention the question number clearly.**

Note: Students can use steam table to solve numerical problems. Assume missing data, if any

Q. No. – 1 Answer the following questions carrying one mark each.   15x1=15

(i)	Write any three types of boiler mountings.
(ii)	What is artificial draught?
(iii)	Define the use of chimney.
(iv)	Discuss the significance of boilers drought.
(v)	What is the effect of superheating in Rankine cycle?
(vi)	Explain the continuity equation.
(vii)	Discuss isentropic heat drop in nozzle.
(viii)	Classify the steam turbines.
(ix)	What is Dalton's law of partial pressure?
(x)	Classify the steam engines.
(xi)	Differentiate between the impulse and reaction turbine.
(xii)	What is governing of steam turbine?
(xiii)	What is use of air expansion pump?
(xiv)	Discuss nozzle efficiency.
(xv)	Discuss the function of boiler accessories.

PART-B (20 Marks)

	UNIT-I	
	UNIT-I	
2	What are the various types of draughts used in regular practice?	5
	UNIT-II	
3	State the methods of increasing the thermal efficiency of Rankine cycle.	5
	UNIT-III	
4	What do you mean by supersaturated flow? Explain with the help of h-s diagram.	5
	UNIT-IV	
5	Derive the expression for blade efficiency in a single stage impulse turbine.	5

PART-C (40 Marks)

	UNIT-I	
	UNIT-I	
6	With neat diagram, explain the construction and working of Babcock and Wilcox boiler.	10

7	Derive an expression to find the height of a chimney. Write at-least five differences between forced draft and induced draft.	**10**
	UNIT-II	
8	Draw the layout of steam power plant operating on Rankine cycle in which the boiler generates super-heated steam. Depict the cycle on p-v and t-s plot and describe its working.	**10**

9	A double acting compound steam engine with two cylinders is supplied with steam at 14 bar and 0.9 dry. The steam is exhausted into the condenser at 0.35 bar. Both the cylinders have stroke length of 350 mm and have equal loads on their piston initially. The diameters of HP and LP cylinders are 200 mm and 300 mm respectively. If the engine runs at 300 rpm. Find:
	  i. Intermediate pressure
	  ii. Indicated power
	  iii. Steam consumption of engine in kg/hr
	Assume diagram factor as 0.8. and complete expansion of steam in HP cylinder.
		10

	UNIT-III	
10	Air flow through a convergent-divergent nozzle. At some section in the nozzle pressure= 2 bar, velocity = 170 m/s and temp 200°C and cross sectional area is 1000mm^2. Assuming isentropic flow conditions, determine: (a) stagnation pressure and stagnation temperature, (b) sonic velocity and Mach number at this section, (c) velocity, Mach number and flow area at outlet section where pressure is 1.1 bar, (d) pressure, temperature, velocity and flow area at throat of the nozzle. Take R = 287 J/kg K, Cp = 1000 J/kg K and γ=1.4	**10**
11	Explain all types of surface condensers with neat diagrams.	**10**
	UNIT-IV	
12	i. What is the condition of maximum efficiency of an impulse turbine? ii. Derive an expression for degree of reaction for reaction turbine.	**10**
13	The following particular refers to a single row impulse turbine: Enthalpy drop in the nozzle and nozzle angle is 45 kJ/kg and 16° Mean diameter of blade ring =0.3 m, Rotational speed of the wheel = 10,000 rev/min Blade exit angle equals the blade inlet angle. Determine: (a) blade inlet angle for shock less entry, and (b) work done and axial thrust for steam flow rate of 1 kg/s. Neglect the effect of friction when passing through blade passages and obtain your solution form the geometry of velocity diagrams	**10**