PAPER CODE- 54011

University Institute of Engineering & Technology

(Recognised Under Section 2(f) and 12B of UGC)

Kurukshetra University, Kurukshetra

Roll No. -

THEORY EXAMINATION – MAY 2019	
B.TECH - ME	SEMESTER - IV

TIME – 3 Hrs.

M.M. - 75

COURSE NO. - ME-204

COURSE TITLE – STEAM GENERATION & POWER

PART-A (15 Marks)

Note: Students can use steam table to solve numerical problems. Assume missing data if any.All questions in Part-A and Part-B are compulsory. Attempt any four questions from Part-C selecting at least one from each unit.

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

(i)	What do you understand by high steam, low water safety valve?
(ii)	Define 'Draught'.
(iii)	List the three mountings of a boiler.
(iv)	Define nozzle efficiency.
(v)	Explain the maximum efficiency of single stage impulse turbine.
(vi)	What is meant by degree of reaction?
(vii)	Discuss steam jet draught.
(viii)	Define reheat factor.
(ix)	What is critical pressure ratio?
(x)	What do you understand by compound steam engine?
(xi)	Discuss the reasons for feed water heating.
(xii)	What is subsonic and supersonic flow?
(xiii)	How impulse turbine is different from the reaction turbine?
(xiv)	What is governing of steam turbine?
(xv)	Write name of any two accessories of a boiler.

PART-B (20 Marks)

	UNIT-I	
2	Sketch and describe the working of Babcock and Wilcox boiler.	5
	UNIT-II	
3	Explain the function of D-slide valve showing its different positions.	5

	UNIT-III	
4	Explain the principle of steam injector used for feeding water to the boiler.	5
	UNIT-IV	
5	Derive the expression for blade efficiency for a single stage impulse turbine.	5

PART-C (40 Marks)

	UNIT-I	
6	Sketch and describe the working of a Locomotive boiler. Show the positions of fusible plug, blow of cock, feed check valve and super heater. Describe the method of obtaining draught in this boiler.	10
7	1. Explain why the super heater tubes are flooded with water at the starting of the boiler. 2. Explain the principle of fire tube and water tube boilers.	5 5
	UNIT-II	
8	The steam at 70 bar and 450□C is supplied to a turbine and reheated to 420□C at 25 bar pressure and then expanded to condenser pressure of 0.07 bar. The system is bled where the temperature of 180□C steam is available for feed heating. The isentropic efficiencies of 1st and 2nd stages are 78.5% and 83% respectively. Determine: 1. The pressure of steam at which bleeding is done. 2. The % of bled steam. Cycle efficiency. Neglect pump work.	10
9	A steam turbine working on Rankine cycle is supplied with dry saturated steam at 25 bar and exhaust takes place at 0.2 bar. For a steam flow rate of 10 kg/s, determine: (a) quality of steam at the end of expansion, (b) turbine shaft work, (c) power required to drive the pump, (d) work ratio, (e) Rankine efficiency and (f) heat flow.	10
	UNIT-III	
10	Steam at 3 bar with 10□C superheat is passed through a convergent nozzle. The velocity of steam entering the nozzle is 91.5 m/s. the back pressure is 1.5 bar. Assuming nozzle efficiency of 90 %. Determine the area of the nozzle at throat. Maximum discharge through nozzle is restricted to 0.45 kg/sec. Take Cps(superheated steam)= 2.2 kJ/kg-□C	10
11	Show that the maximum discharge of steam through a nozzle takes place when the ratio of steam pressure at the throat to the inlet pressure is $\left(\frac{2}{n+1}\right)^{\frac{n}{n-1}}$ where n is the index of adiabatic expansion.	10
	UNIT-IV	
12	The velocity of steam at inlet to a single row impulse turbine is 400 m/s and the nozzle angle is 20° The mean blade speed is 150 m/s and the axial thrust on the blade is estimated to be zero. Make calculation for:(a) Inlet and outlet angles of moving blades.(b) power developer for a steam flow rate of 1.5 kg/s, and (c) Magnitude and direction of velocity of steam at exit. Neglect the effect of friction when passing through the blade passages and obtain your solution from the geometry of velocity diagram.	10
13	Sketch and explain the velocity compounded impulse turbine. Indicate the pressure and velocity variations along the turbine axis. Where this system of compounding is used?	10