[Total No. of Printed Pages:2] **CODE NO:- U-90**

FACULTY OF ENGINEERING & TECHNOLOGY

S.E.(Mach/Prod)Examination - DEC - 2014

Thermodynamics-II(Revised)

[Time: THREE Hours] **[Max. Marks: 80]**

"Please check whether you have got the right question paper."

N.B
i) Question No.1 form Section A and Question No.6 from Section B are compulsory.
ii) Attempt any Two questions from the remaining Questions in each section.
iii) Use of Steam tables, Mollier charts, non-programmable calculator is permitted.
iv) Assume suitable data, if necessary.

SECTION A

Q.1 Solve any five: 10

a) Define boiler and list the primary requirements of boilers.
b) Explain internally fired and externally fired boilers.
c) Discuss the significance of equivalent evaporation.
d) Explain the friction in boiler chimney.
e) Define natural draught and artificial draught.
f) What is steam jet draught?
g) Draw and explain the 'Discharge' versus 'ratio of pressures at outlet to inlet' Curve for convergent steam nozzle.
h) Explain the supersaturated expansion of steam in a nozzle with neat sketch.

Q.2 a) Explain with neat sketch the working principle of LaMont (high pressure) boiler. 07

b) 5400kg of steam is produced per hour at a pressure of 7.5 bars in a boiler with feed water at 41.5^{o}C. The dryness fraction of steam at exit is 0.98. The amount of coal burnt per hour is 670kg of calorific value 31000kj/kg. Determine: (i) boiler efficiency, (ii) equivalent evaporation and, (iii) factor of evaporation. 08

Q.3 a) Derive the equation for height and diameter of chimney for a given draught (hw). 08

b) Explain forced and induced draught. 07

Q.4 a) Dry saturated steam at a pressure of 10 bar enters in a nozzle and is discharged at a pressure of 1.8 bar. Find the find the final velocity of the steam, when the initial velocity of the steam is negligible. If 10% of the heat drop is lost in friction, find the percentage reduction in the final velocity. 07

b) Derive the condition for maximum discharge through a nozzle. 08

Q.5 Write short notes on (any two) 15

Q.5 a. IBR laws
b. Height of boiler chimney
c. Wilson line in a metastable flow

SECTION B

Q.6	Solve any five:		10
	a)	Define steam condenser and state its objects.	
	b)	Explain surface condenser. State its types.	
	c)	What are the sources of air in the condensers?	
	d)	Derive an expression for Carnot cycle efficiency.	
	e)	Define work ratio and specific steam consumption.	
	f)	Explain in short the necessary of modification of Rankine cycle?	
	g)	Explain effect of clearance volume on capacity of the reciprocating compressor.	
	h)	Define and explain isothermal efficiency of compressor.	
Q.7	a)	Explain condenser and vacuum efficiency.	07
	b)	In a surface condenser, the vacuum maintained is 700 mm of hg. The barometer reads 754mm.If the temperature of condenser is 18^{o} C, determine (i) mass of air per kg of steam and (ii) vacuum efficiency.	08
Q.8	a)	Explain why the Rankine cycle rather than Carnot cycle is used as standard reference for the steam power plants	07
	b)	Consider a steam power plant operating on the simple idea Rankine cycle. Steam enters the turbine at 3 MP a and350^{o}C and is condensed in the condenser at a pressure of 75kPa. Determine the thermal efficiency of this cycle.	08
Q.9	a)	Obtain the condition of maximum efficiency of a two stage air compressor with perfect intercooling.	07
	b)	Two stage compressors take in air at 1 bar and 18^{o}C and delivers at 40 bars. FAD is $5.75m^{3}$/min. The speed of the compressor is 300 rpm. The stroke of the piston is equal to the diameter of low pressure cylinder. Mechanical efficiency is 85% .Compressor is working for minimum power .find, (i) diameters of low pressure and high pressure cylinder, (ii) minimum power required. Take $pV^{1.35=}c$.	08
Q.10	Write short notes on (any two)		15
	a)	Centrifugal compressor	
	b)	Air motor	
	c)	Regenerative cycle	