


Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End term Examination, June/July 2020

Course: Applied thermodynamics

Semester: IV

Program: Mechanical

Time : 03 hrs.

Course Code: MECH 2024

Max. Marks: 100

Instructions:

SECTION A
(25*1=25 marks) / 60 min
(Answer all questions)

S. No.	Question 1:	Marks	CO
i	A refrigeration and heat pump works between the same temperature limits. If COP of the refrigerator is 4 then COP of pump would be (a) 3 (b) 4 (c) 5 (d) cannot predict	1	CO1
ii	Availability function is expressed as : (a) U+PoV-ToS (b) U+PoV-TodS (c) Both of them (d) None of them	1	CO1
iii	In Reversed Carnot cycle having perfect gas as working medium (a) Isothermal work of expansion is equal to isothermal work of expansion (b) Isothermal work of compression is equal to isentropic work of expansion (c) Net work of the cycle is zero (d) Net heat transfer of the cycle is zero.	1	CO1
iv	The COP of Carnot refrigerator is 3 with 1 ton of refrigeration, the work done would be (a) 210 KJ/min (b) 70 KJ/min (c) 100 KJ/min (d) 200KJ/min	1	CO1
v	The clearance volume serves the purpose of (a) To reduce the work done (b) To increase the volumetric efficiency (c) To accommodate valves seating (d) Create turbulence in intake air	1	CO1
vi	For the same overall pressure ratio, the leakage of air past the piston for multistage compression as compared to single stage compression is (a) More (b) less (c) constant (d) may be more or less	1	CO1
vii	A domestic refrigeration capacity may be nearly (a) 1 ton (b) 0.1 ton (c) 5 ton (d) 10 ton	1	CO1
viii	The effect of superheating the vapor before suction to compression in vapor compression refrigeration system (a) Increase the work of compression (b) Increase the heat rejection in condenser	1	CO1

	(c) None of them (d) All of them		
ix	In vapour compression refrigeration cycle, decrease in vapour temperature keeping condenser temperature fixed results in (a) Decrease in refrigeration effect per kg (b) Decrease in volumetric efficiency per kg of compressor (c) Increase in compressor work per kg (d) All of the above	1	CO1
x	Sub cooling is a process of cooling the refrigerant in vapour compression refrigeration system (a) After compression (b) before compression (c) before throttling (d) none	1	CO1
xi	For a convergent divergent nozzle with isentropic flow where $V < a$ (a) The nozzle is divergent (b) the nozzle is convergent (c) may be both depending on steam quality (d) none of them	1	CO1
xii	Which of the following variables controls the physical properties of a perfect gas (a) pressure (b) temperature (c) volume (d) all of the above	1	CO1
xiii	Temperature of a gas is produced due to (a) its heating value (b) kinetic energy of molecules (c) repulsion of molecules (d) attraction of molecules (e) surface tension of molecules.	1	CO1
xiv	Mixture of ice and water form a (a) closed system (b) open system (c) isolated system (d) heterogeneous system (e) thermodynamic system.	1	CO1
xv	The door of a running refrigerator inside a room was left open. Which of the following statements is correct? (a) The room will be cooled to the temperature inside the refrigerator. (b) The room will be cooled very slightly. (c) The room will be gradually warmed up. (d) The temperature of the air in room will remain unaffected. (e) any one of above is possible depending on the capacity.	1	CO1

xvi	A manufacturer claims to have a heat engine capable of developing 100KJ by receiving heat input of 200 KJ and working between the temperature limits of 227° C and 27° C. His claim is (a) justified (b) not possible (c) may be possible with lot of sophistications (d) cost will be very high (e) theoretically possible	1	CO1
xvii	Thermal power plant works on (a) Carnot cycle (b) Joule cycle (d) Rankine cycle (d) Otto cycle (e) Brayton cycle.	1	CO1
xviii	For same compression ratio and for same heat added (a) Otto cycle is more efficient than Diesel cycle (b) Diesel cycle is more efficient than Otto cycle (c) efficiency depends on other factors (d) both Otto and Diesel cycles are equally efficient (e) none of the above	1	CO1
xix	Diesel cycle consists of following four processes (a) two isothermals and two isentropic (b) two isentropic, and two constant volumes. (c) two isentropic, one constant volume and one constant pressure (d) two isentropic and two constant pressures (e) none of the above.	1	CO1
xx	For a convergent divergent nozzle with isentropic flow where $V > a$ (a) The nozzle is convergent divergent (b) the nozzle is convergent (c) may be both depending on steam quality (d) none of them	1	CO1
xxi	Which of the following is true for steam flow through nozzle? (a) The flow is assumed to be adiabatic (b) The steam loses its pressure and heat while passing through nozzle (c) The work done is equal to the adiabatic heat drop (d) All of the above	1	CO1
xxii	The correct order in which energy is converted from one form to another, in steam power plant is (a) Kinetic energy – potential energy – mechanical energy – electrical energy (b) Kinetic energy – potential energy– electrical energy – mechanical energy (c) potential energy – Kinetic energy –mechanical energy – electrical energy (d) mechanical energy – potential energy – Kinetic energy –electrical energy	1	CO1
xxiii	In velocity compounding, steam is passed through (a) fixed nozzle-moving blades-fixed blades-moving blades (b) fixed nozzle-moving blades-fixed nozzles-moving blades (c) moving blades-fixed nozzles- fixed blades-moving blades	1	CO1

	(d) fixed blades-moving blades-fixed nozzles- moving blades		
xiv	In pressure velocity compounding (a) moving blades are used (b) fixed nozzles are used (c) fixed blades are used (d) All of the above are used	1	CO1
xv	Degree of reaction is given by (a) Heat drop in moving blades / total heat drop in the stage (b) Heat drop in fixed blades / total heat drop in the stage (c) Heat drop in moving blades / Heat drop in fixed blades (d) total heat drop in the stage / Heat drop in fixed blades	1	CO1
	SECTION B (10*5=50 marks) / 120 min (Answer each question with short and precise answer)		
Q2	Write your comments on the limitation of following cycles: Carnot cycle, Dual cycle, Carnot refrigeration cycle, Rankine cycle, Vapor compression cycle and Brayton cycle in your own words.	15	CO2
Q3	For same heat input and work done/required, arrange the above cycle in decreasing order of efficiency with your justification.	15	CO2
Q4	Give five examples and show how psychrometry play an important role in your daily life routine.	15	CO3
Q5	Explain how the compressibility and shock wave generation affects the design of fighter jets.	15	CO4
Q6	In recent decades, power generation using steam turbine have not shown significant growth as compared to other conventional power generation sources. Give your comments. Or Explain an increases in compressor efficiency due to intercooling and staging. Which one is more effective and preferred from your point of view?	15	CO4