Register Number:……..

KUMARAGURU
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GENERAL INSTRUCTIONS TO THE CANDIDATES

Candidates are instructed to answer the questions as per Bloom's Taxonomy knowledge level (K_1 to K_6)

Candidates are strictly instructed not to write anything in the question paper other than their roll number.

Candidates should search their pockets, desks and benches and handover to the Hall Superintendent/ Invigilator if any paper, book or note which they may find therein as soon as they enter the examination hall.

Candidates are not permitted to bring electronic watches with memory, laptop computers, personal systems, walkie-talkie sets, paging devices, mobile phones, cameras, recording systems or any other gadget / device /object that would be of unfair assistance to him / her.

Corrective measures as per KCT examination policies will be imposed for malpractice in the hall like copying from any papers, books or notes and attempting to elicit the answer from neighbours.

B.E DEGREE EXAMINATIONS: DEC 2015

(Regulation 2014)

Third Semester

AUTOMOBILE ENGINEERING

U14AUT302**:** Thermodynamics And Thermal Engineering

(Use of Steam Tables, Mollier Chart &Psychrometry Chart , HMT data book are permitted)

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Find the correct matching CO1 [K_2]

List I	**List II**
A. Isochoric	i. $W=p_1v_1\ln\ (v_2/v_1)$
B. Isobaric	ii. $W=0$
C. Adiabatic	iii. $W=p(v_2 - v_1)$
D. Isothermal	iv. $W=(p_1v_1 - p_2v_2)\ /\ (\square -1)$

	A	B	C	D
a)	2	1	3	4
b)	2	3	4	1
c)	2	4	3	1
d)	3	1	2	4

2. Which one of the following property is independent of size? CO1 [K_2]

a) volume b) energy

c) density d) mass

3. For the same compression ratio which cycle is more efficient CO1 [K_2]

a) Otto b) Diesel

c) Dual d) Brayton

4. The volumetric efficiency of compressor is increased by CO1 [K_2]

a) Multi stage compression b) Intercooler

c) Higher pressure ratio d) a&b

5. Consider the following statements CO1 [K_2]

1. wet steam means, dryness fraction (x) = 1

2. dry steam means, dryness fraction (x) =1

3. boiling point of water is 100^oC at 1 bar

4. Steam nozzle produces work

Which of the statements are correct?

a) 1&2 b) 3 &4

c) 2&3 d) 2&4

6. The Air standard efficiency of Brayton cycle is CO1 [K2]

a) $1-[1/r_p^{\gamma-1}]$ b) $1-[1/r_p^{\gamma-1/\gamma}]$

c) $1-[1/r_p^{\gamma}]$ d) $1-[1/r_p]$

7. Assertion (A): 1 ton of ice is produced in 24 hrs by I TON capacity refrigerator CO1 [K_2]

Reason (R): 3.5kW heat is removed by 1 Ton capacity refrigerator

a) Both A & R are true and R is the correct explanation of A b) Both A & R are true and R is not the correct explanation of A

c) A is True R is False d) A is False R is True

8. Which one of the following is not part of Vapour Compression Refrigeration system? CO1 [K_2]

a) Compressor b) Condenser

c) Evaporator d) Absorber

9. What is the correct sequence of VAR system? CO1 [K_2]

1.Expansion 2. Condensation 3. Evapouration 4. Absorption

a) 1-2-3-4 b) 4-2-1-3

c) 4-3-2-1 d) 1-3-2-4

10. The heat transfer through a plate by conduction is not dependent on ---------- CO1 [K_2]

a) ΔT b) conductivity

c) Mass flow rate of air d) Thickness of the plate

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11.	Distinguish between Closed thermodynamic system and open thermodynamic system	CO1	[K_2]
12.	State Clausius statement of second law of thermodynamics	CO1	[K_2]
13.	For the same maximum pressure compare Otto, Diesel & Dual cycles for the efficiency	CO1	[K_2]
14.	What are the three main advantages of multi stage compressor?	CO1	[K_2]
15.	Define dryness fraction of a steam. The dryness fraction of exit steam from a steam turbine should not be less than 0.8; Why?	CO2	[K_4]
16.	Draw the pV diagram of Brayton cycle and indicate all the processes	CO1	[K_2]
17.	Define: DPT,RH	CO1	[K_2]
18.	What do you understand from Ton of Refrigeration?	CO1	[K_2]
19.	What are the modes of heat transfer?	CO1	[K_2]
20.	Define LMTD.	CO1	[K_2]

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)

Q.No. 21 is Compulsory

21.	(i) Derive an expression for Air Standard Efficiency of Otto cycle with p-v and corresponding T-S diagrams, in terms of compression ratio. (ii) Also compare Otto, Diesel & Dual cycles.	(10) (4)	CO2	[K_3]
22.	A reversible heat engine operates between two reservoirs at temperatures of 600 degree C and 40^o C. The engine drives a reversible refrigerator which operates between reservoirs at temperatures of 40 and – 20^0 C. The heat transfer to the heat engine is 2000 kJ and net work output of the combined engine refrigerator plant is 360 kJ. Evaluate the heat transfer to the refrigerant and the net heat transfer to the reservoir at 40^oC.		CO2	[K_4]
23.	Nitrogen gas at 1 bar and 27^oC is compressed adiabatically up to 10 bar and then expanded isothermally up to initial specific volume and then cooled at constant volume to initial conditions. Find work, heat , change in internal energy and change in entropy per kg of nitrogen for each process and for the entire processes. Take R=0.297 kJ/kg K, C_v= 0.742 kJ/kg.K		CO1	[K_3]

24.	Super heated steam at 10 bar 300^0C enters a steam turbine and leaves at 0.2 bar.Find (i) condition of steam at exit, (ii) Turbine work in kW if the mass of steam is 2 kg/s (iii) Rankine efficiency neglecting the pump work.		CO2	[K_4]
25.	(i)Explain how Vapour Compression Refrigeration system is working with the help of relevant pictorial illustration (ii) Compare Vapour Compression Refrigeration system with Vapour Absorption Refrigeration system.	(10) (4)	CO2	[K_2]
26.	An exterior wall of a house may be approximated by a 0.1m layer of common brick (k=0.7 W/m^{o}C) followed by a 0.04m layer of gypsum plaster (k=0.48 W/m^{o}C).What thickness of loosely packed rock wool insulation (k=0.065 W/m^{o}C) should be added if the temperature difference between room and outdoor is 20^{o}C?		CO3	[K_4]

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