School of Aeronautics (Neemrana)

Question Paper For Internal Assessment Examination (Theory) - Old Scheme i.e 2012 Syllabus

Instructions For Students / Faculty

Mid Term I (Total 40 Marks, 1 Hr. & 30 Min, Syllabus From Beginning of The Session)

Total number of questions to be given are 8, each carrying 10 marks and it is compulsory to attend 2 questions from each part i.e. Part A and B. There is a choice of two questions out of four in each part. Part A will be theoretical or derivation type **(Not More Than 70 Words For Question).** Part B will be fully numerically oriented questions **(Not More Than 70 Words For Question)**, except for the list of subjects given below. No objective type or fill in the blanks shall be given, but subpart of question can be given for both Part A & B.

Mid Term II (Total 50 Marks, 1 Hr. & 45 Min, Syllabus From Beginning of The Session)

Total number of questions to be given are 8, each carrying 10 marks and it is compulsory to attend 2 questions from Part A and three questions from Part B. There is a choice of two questions out of four in part A and 3 questions out of 4 in Part B. Part A will be theoretical or derivation type **(Not More Than 70 Words For Question).** Part B will be fully numerically oriented questions **(Not More Than 70 Words For Question)**, except for the list of subjects given below. No objective type or fill in the blanks shall be given, but subpart of question can be given for both Part A & B.

Mid Term III (Total 60 Marks, 2 Hrs, Syllabus From Beginning of The Session)

Total number of questions to be given are 10, each carrying 10 marks and it is compulsory to attend 2 questions from Part A and 4 questions from Part B. There is a choice of two questions out of four in part A and 4 questions out of 6 in Part B. Part A will be theoretical or derivation type **(Not More Than 70 Words For Question).** Part B will be fully numerically oriented questions **(Not More Than 70 Words For Question)**, except for the list of subjects given below. No objective type or fill in the blanks shall be given, but subpart of question can be given for both Part A & B.

*** LIST OF ELABORATIVE THEORY QUESTION SUBJECTS**: Aircraft Materials, Aircraft System, Aircraft Rules & Regulation-I, Mechanics of Composite Materials, Aircraft Design, Aircraft Rules & Regulation-II, Avionics-I, Helicopter Theory, Maintenance of Airframe and System Design, Avionics-II, Airlines and Airport Management, Maintenance of Power Plant & Systems

FACULTY MEMBERS, PLEASE ENSURE EXCEPT ABOVE LISTED SUBJECTS, NO THEORITICAL ELABORATIVE QUESTION SHOULD BE GIVEN IN PART 'B' OF QUESTION PAPER

STUDENT IS ALLOWED TO ENTER LATE NOT MORE THAN 15 MIN AFTER STARTING OF

STUDENT IS ALLOWED TO ENTER LATE NOT MORE THAN 15 MIN AFTER STARTING OF EXAM, AND MAY LEAVE THE EXAM HALL ON EXPIRY OF ATLEAST OF 1 Hr FROM THE STARTING TIME OF EXAMINATION

Question Paper & Student Details

Mid Term*	Mid Term 1	**Date of Submission of QP**	02/09/2019
Name of Faculty*	Sidhartha Sondh	**Date of Examination***	09/09/2019
Subject*	7MH4 - Refrigeration and Air Conditionin...	**Course***	B.Tech (Mechatronics Engine...
Batch	Second (2)	**Semest...**	Semester : 7
Email Id of Faculty:*	sidharthasondh2010@gmail.com	**Phone Number of Faculty***	963 455 7511

Student Name		**Student Reg No.**	

Part A

Question : 1* 1. What is the difference between a refrigerator and air conditioner?

Lesson Plan*	1	**Topic***	Fundamentals	**Source***	Self

Question : 2* 2. Explain reversed Carnot cycle in detail.

Lesson Plan*	3	**Topic***	Reversed Carnot cycle	**Source***	Self

Question : 3*

3. Write a short note on:
I. T-S diagram
II. P-V diagram
III. P-h diagram

Lesson Plan* 5 **Topic*** Cycles **Source*** Self

Question : 4*

4. What is the need of multi-stage compressor and evaporator in a refrigerator?

Lesson Plan* 8 **Topic*** Multi stage **Source*** Self

Part B

Question : 1*

5. Ambient air temperatures during summer and winter in are 45 °C and 15 °C respectively. Find values of COP for air conditioner for cooling and heating, corresponding to refrigeration temperatures of 5 °C for summers and heating temperature of 55 °C of winter. If water from cooling-tower at 30 °C is used as cooling medium with 3 °C temperature differential for air-conditioning in summer, what is COP for cooling?

Lesson Plan* 6 **Topic*** Vapour Compression cy **Source*** Refrigeration and

Question : 2*

6. Make a complete analysis for the vapor compression cycle with the help of p-h diagram and T-S diagram.

Lesson Plan* 6 **Topic*** Vapour Compression cy **Source*** Self

Question : 3*

7. A vapor-compression cycle using refrigerant R22 operates at condensing temperature of 36 °C and evaporative temperature of -16 °C. For a system capacity of 55 kW, calculate:
a) Mass flow rate
b) Compressor power
c) Refrigerating effect
d) Coefficient of performance.
Enthalpy of refrigerant at the end of evaporator is 398.64 kJ/kg, at the end of compressor is 428 kJ/kg and enthalpy at inlet of expansion-valve is 244.34 kJ/kg.

Lesson Plan* 6 **Topic*** Vapour Compression cy **Source*** Refrigeration and

Question : 4*

8. A domestic food freezer maintains a temperature of -15 °C. The ambient air temperature is 30 °C. If the heat leaks into the freezer 1.75kJ/s continuously, what is the least power necessary to pump this heat out continuously? Also draw the thermodynamic diagram for the refrigerator.

Lesson Plan* 4 **Topic*** Heat Pump **Source*** Thermal Engineer

Question : 5

Lesson Plan **Topic** **Source**

Question : 6

Lesson Plan **Topic** **Source**

Upload Scanned Document In Case of Numerical or Diagram for any of the above question

Mention question number with relevant fig / numerical / equations. Max 150 KB

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I have scrutinized the question paper. There is no spelling mistake or any type of irrelevant question.

Answer Sheet Details	
Mid Term	Mid Term 1
Name of Faculty	Sidhartha Sondh
Subject	7MH4 - Refrigeration and Air Conditioning (Old)
Date of Submission of QP	16/09/2019
Batch	Second (2)
Email Id of Faculty:	sidharthasondh2010@gmail.com
Date of Examination	09/09/2019
Course	B.Tech (Mechatronics Engineering)
Semester	Semester : 7
Phone Number of Faculty	963-455-7511

Part A	
Question : 1	1) A major difference between refrigeration and air conditioning is the point of supply for the gases. Refrigeration systems have gas installed in a series of tubes. In old refrigerators, this gas was chloro-flour--carbon, or CFC, but this has harmful effects on people, so refrigerators not contain HFC-134a. HFC-134a is the sole gas used as a coolant in refrigeration systems. Air conditioning systems use built-in chemicals, but also air from the room or rooms being heated. Gases built into air conditioning units cool air that circulates through the unit; the unit then redistributes the cooled air through the room. 2) Air conditioners have circulation systems designed to project cool air away from the units while refrigeration units have circulation systems designed to retain coolant in a confined space. Refrigeration systems circulate cool liquids and gases through a series of tubes and vents. Cool air from within a refrigerator is sucked into a compressor that recycles the gas through the tubes. 3)Air conditioners, while also employing tubes in the coolant system, have fans for the dispersal of air. Unlike refrigeration systems, which keep gases contained to a pre-determined space, air conditioning systems disperse cool air throughout areas of unknown volume.
Question : 2	Carnot cycle is a totally reversible cycle which consists of two reversible isothermal processes and two isentropic processes. It has the maximum efficiency for a given temperature limit. Since it is a reversible cycle, all four processes can be reversed. This will reverse the direction of heat and work interactions, therefore producing a refrigeration cycle. The cycle consists of 1-2: Isothermal heat transfer from cold medium to refrigerant (Evaporator) 2-3: Isentropic (Reversible adiabatic) compression 3-4: Isothermal heat rejection (condenser) 4-1: Isentropic Expansion

Question : 3	Thermodynamic cycles are representation of changes which a system is undergoing . Pressure, volume, specific enthalpy, specific entropy, flow rate ,temperature , density, etc are some of the thermophysical properties which are used to describe the state of the system at a certain point. PV and T_S plots are used to assess the changes. p-v diagram gives direct feel of work involved in different processes of cycle and T-s diagram gives direct feel of heat transfer in various processes of the cycle.
Question : 4	Multi-stage compressor is needed because: i) As index of compression 'n' increases it increases compression work. ii) Increase in pressure ratio (P2/P1) it increases work as well as size of cylinder. iii) Increment in pressure ratio (P2/P1) beyond certain limit, volumetric efficiency decreases while it increases leakage loss on either sides the piston and valves. Due to above pointes and for higher pressure ratio compressor needs multistaging.
Part B	
Question : 1	COP = Desired Effect/Work Done Also COP = T2/ (T1 - T2) All temperatures are given, we can solve for COP.
Question : 2	The compressor, condenser, throttle and evaporator are analyzed in sequence with this equation, a statement of the conservation of energy, $q - w = \Delta h + \Delta KE + \Delta PE$ Compressor: Consider the energy flows in the compressor. For an adiabatic process, $q = 0$. Also $\Delta KE = 0$ and $\Delta PE = 0$. Hence $-w = \Delta h$. Work done by compressor = (h2-h1). Condenser: For the condenser, $w = 0$, $\Delta KE = 0$ and $\Delta PE = 0$. Hence $q = \Delta h$, $q = (h2 - h3)$. Throttle: For the throttle, $q = 0$, $w = 0$, $\Delta KE = 0$ and $\Delta PE = 0$. Hence $\Delta h = 0$, $h3 = h4$. Evaporator: For the evaporator, $w = 0$, $\Delta KE = 0$ and $\Delta PE = 0$. Hence $q = \Delta h$, $q = h1 - h4$
Question : 3	(i)Refrigerating capacity = m(h2 - h1) = m (398.64 - 244.44) = 55kW m = 0.36 kg/s. (ii) Compressor work W = m(h3 - h2) = 0.36 (428 - 398.64) 10.57 kW (iii) COP = RE/W = 55/(10.57) = 5.20.
Question : 4	COP = Desired Effect/W = Q2/ W (i) Also COP = T2/ (T1 - T2) (ii) = (-15 + 273) / (30 - (-15)) From here comparing the two equations W = 1.75 x (45/258) = 0.305 kW
Question : 5	
Question : 6	

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I have scrutinized the answer sheet. There is no spelling mistake or any type of irrelevant answers.	

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