

SDM College of Engineering and Technology, Dharwad-580002
Department of Mechanical Engineering

Internal Assessment - I

Subject: Refrigeration and Air -Conditioning Subject Code: 15UMEE525 Max-Marks: 20
Semester: V, Division: A & B Date: 20/09/2019 Time: 11:00 AM to 12:00 PM
Course Instructor: Prof. Dr. Jayaraj Y. Kudariyavar and Prof. Venkatesh P. Pandharikar
Note: 1) Refrigeration Tables and Charts Data Hand Book is allowed
2) Answer any one full question Q1 or Q2. And Q3 is compulsory.

Q 1 a) With neat sketch explain the working principle of Vapour Compression Refrigeration system. And also draw neat P-h and T-s diagrams. **(5 Marks)**
CO – 1,2

b) A vapour compression refrigerator uses R12 as refrigerant and the liquid evaporates in the evaporator at -15°C . The temperature of this refrigerant at the delivery from the compressor is 15°C , when the vapour is condensed at 10°C . Find the COP of the refrigerator if the liquid is sub-cooled by 5°C before expansion by throttling and also draw the corresponding p-h and T-s diagram. Take C_p of the super heated vapour as 0.64 kJ/kg.K and C_p of the liquid as 0.94 kJ/kg.K and also take the following properties of refrigerant:

Temperature ($^{\circ}\text{C}$)	Specific Enthalpy (kJ/kg)		Specific Entropy (kJ/kg K)	
	Liquid	Vapour	Liquid	Vapour
-15	22.3	180.88	0.0904	0.7051
10	45.4	191.76	0.1750	0.6921

OR

Q 2 a) Explain different methods of Refrigeration Systems. **(5 Marks)**
CO – 1

b) A compressor refrigeration system using R12 as refrigerant develops 15 tons of refrigeration. The evaporation and condensing temperatures are -5°C and 40°C respectively. Using p-h diagram, find the followings: **(5 Marks)**
CO – 2,3,6

- i) The mass flow rate of the refrigerant.
- ii) COP of the cycle.
- iii) Power required to drive the compressor.
- iv) Carnot COP if it works between the given temperature limits.

Q 3 a) With neat P-V and T-S diagram derive an expression of COP for Carnot Refrigeration Cycle in terms of maximum and minimum temperatures. **(5 Marks)**
CO – 1

b) The capacity of a refrigerator is 200 TR when working between -6°C and 25°C . Determine the mass of ice produced per day from water available at 25°C . Also find the power required to drive the unit. Assume that the cycle operates on reversed Carnot Cycle and latent heat of ice is 335 kJ/kg . **(5 Marks)**
CO – 1

SDM COLLEGE OF ENGINEERING & TECHNOLOGY, DHARWAD.

**Department of Mechanical Engineering
Semester End Examinations, December-2018**

Sub Code : 15UMEC701

Semester: VII

Sub Title : Hydraulics and Pneumatics

Duration : 3 Hrs

Max Marks: 100

Note: Answer Part A (compulsory) and any FOUR full questions from Part B

PART-A

Q1 Fill in the blanks 10 Marks

- i Force multiplication in oil power hydraulics is application of _____ law.
- ii The volumetric displacement of a gear pump is given by _____.
- iii The power output of a hydraulic cylinder with 24 kN output at a velocity of 3 m/s is _____.
- iv Pressure reducing valve senses _____ pressure.
- v Regenerative velocity of a hydraulic cylinder is given by _____.
- vi The symbolic representation of lubricator used in pneumatics is _____.
- vii ISO symbol for 3/2 normally open DCV _____.
- viii The _____ converts the compressed air energy into mechanical energy in the form of linear movement in one direction only.
- ix In electro-pneumatic DCV the actuation is done by _____.
- x Periodic checking of movements and direction of pneumatic components ensures efficient _____.

Q2

- a The displacement of a hydraulic motor is 180 cc /rev and operating pressure is 70 bar and speed is 1800 rpm. If the actual flow rate consumed by rotor is 6 Lps and the actual torque delivered by motor is 165 N-m Find 5 Marks
 - (i) Volumetric Efficiency
 - (ii) Mechanical Efficiency
 - (iii) Overall Efficiency
- b A pump produces 100 Lpm at 10000 kPa. It turns at 1800rpm. Assume 100% efficiency 5 Marks
Find the
 - (i) Hydraulic power produced
 - (ii) Input torque required
 - (iii) Power required

PART-B

Q3

- a Explain the concept of multiplication of force with the help of Pascal's law. 6 Marks

- Q3 b Two cylinders are connected as shown in fig. 3 (b). Assume that cylinder A is a single acting hand pump with a 12 mm diameter and 75 mm stroke. An operator is using the hand pump to lift 450kg load. He needs to raise the load 600 mm. He exerts a force of 25 kg on the piston of cylinder A. Find the **6 Marks**
- Number of hand-pump strokes required
 - Multiplication of force
 - Diameter of cylinder B.
- c Explain any six pneumatic components essential in pneumatic control system. Draw the circuit diagram. **8 Marks**
- Q4 a With a neat sketch explain the working is a simple vane pump. **6 Marks**
- b What do you understand by PDP? Explain the classification of PDP pumps. **8 Marks**
- c A gear box is driven by a hydraulic motor that turns at 700 rpm. The pressure drop through the motor is 12000 kPa. The gearbox requires a 40 N.m torque input. The motor has mechanical and volumetric efficiencies of 0.95 and 0.85 respectively. What flow rate is required to turn the motor at the required speed? **6 Marks**
- Q5 a Draw the symbolic representation of the following hydraulic control valves. **8 Marks**
- Pressure reducing valve
 - Brake valve
 - Unloading valve
 - Sequencing valve
- b Draw any four popular center configurations in a three position D C valve and explain the function of each. **8 Marks**
- c What is the purpose of pressure relief valve? How it is different from pressure reducing valve? **4 Marks**
- Q6 a Draw the regenerative circuit diagram. Show that in a regenerative circuit the extending and retracting speeds of the cylinder can be made equal when the piston area equals two times the rod area? **8 Marks**
- b In what circumstances meter-out flow is preferred to meter in flow system. What are the disadvantages of meter-out system? **6 Marks**
- c With the help of circuit diagram explain briefly THTD circuit used in pneumatics. **6 Marks**
- Q7 a List common problems in pneumatic systems. **6 Marks**
- b With the help of circuit diagrams explain direct and indirect control of single acting cylinder in electro-pneumatics. **8 Marks**
- c Draw electro-pneumatic circuit diagram to explain AND & OR logic? **6 Marks**

Q.No.	2.a	2.b	3.a	3.b	3.c	4.a	4.b	4.c	5.a	5.b	5.c	6.a	6.b	6.c	7.a	7.b	7.c
CO	2	2	1	1	1	2	2	2	3	3	3	4	4	5	6	5	5