SILVER OAK COLLEGE OF ENGINEERING & TECHNOLOGY

BE - SEMESTER-VIII • MID SEMESTER-I • EXAMINATION – SUMMER 2016

SUBJECT: REFRIGERATION & AIR CONDITIONING (181901) (ME)

DATE: 22-02-2016 TIME: 02.00PM TO 03.15 PM TOTAL MARKS: 30

Instructions:
1. All the questions are compulsory.
2. Figures to the right indicate full marks.
3. Assume suitable data if required.

Q.1 (a) Define the term:
1) Tonne of Refrigeration
2) COP
(b) Compare Refrigerator, Heat pump and Heat Engine.
(c) Explain with reference to T-s diagram, the stages involved in vapour compression process of refrigeration. Establish an expression for coefficient of performance

Q.2 (a) Describe boot-strap cycle of air refrigeration system with a schematic diagram and show the cycle on T-s diagram.
(b) A refrigerating system operates on a Reversed Carnot Cycle. The higher temperature of the refrigerant in the system is 35°C and the lower temperature is -15°C. The capacity is to be 12 tonnes. Determine (i) C.O.P (ii) Heat rejected from the system per hour (iii) Power required
(c) I. Why Dry compression is preferred over Wet Compression in VCRS.
   II. Why Expander is used in Air Refrigeration instead of Throttling Valve.

OR

Q.2 (a) An air refrigerator system operating on Bell Coleman cycle, takes in air from cold room at 268 K and compresses it from 1 bar to 5.5 bar (the index of compression = 1.25). The compressed air is cooled to 300 K. The ambient temperature is 20°C. Air expands in expander where the index of expansion is 1.35.
Calculate:
   I. C.O.P of the system
   II. Quantity of air circulated per minute for production of 15000 kg of ice per day at 0°C from water at 20°C (Assume C_p for Water = 4.18 kJ/kgK & Latent heat of ice = 335 kJ/kg)
   III. Capacity of the plant
(b) Explain a two stage compression system with liquid intercooler.
(c) Explain the effect of subcooling of condensate with the help of P-h diagram in vapour compression system.

Q.3 (a) Define the following terms:
I. Dry Bulb Temperature
II. Wet Bulb Temperature
III. Dew Point Temperature
IV. Specific Humidity
V. Relative Humidity
For an air sample:
DBT is 40°C and WBT is 28°C, calculate the following (without using psychrometry chart):
1) Specific humidity,
2) relative humidity
3) Enthalpy of mixture per kg of dry air.
Assume:
- atmospheric pressure is 1.03 bar,
- saturation pressure at 40°C is 0.0738 bar,
- saturation pressure at 28°C is 0.0378 bar,
specific heat for air is 1.005 kJ/kg K
And for water vapor is 1.88 kJ/kg K.

OR

Q.3 (a) What is a psychrometric process? Explain and draw all the psychrometric processes in which moist is removed or added on the skeleton psychrometric chart.

(b) A Vapour Compression refrigerator uses R-12 as refrigerant and liquid evaporates in the evaporator at -15°C. The vapour leaves the evaporator saturated and dry. When the vapour is condensed at 10°C. Find the C.O.P. if there is no undercooling.
Take Specific heat at constant Pressure for superheated vapour = 0.64 kJ/Kg K

<table>
<thead>
<tr>
<th>Temperature in °C</th>
<th>Enthalpy in kJ/kg</th>
<th>Specific entropy in kJ/kg K</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Liquid</td>
<td>Vapour</td>
</tr>
<tr>
<td>-15</td>
<td>22.3</td>
<td>180.88</td>
</tr>
<tr>
<td>10</td>
<td>45.4</td>
<td>191.76</td>
</tr>
</tbody>
</table>
SILVER OAK COLLEGE OF ENGINEERING & TECHNOLOGY

BE - SEMESTER–VIII • MID SEMESTER-I EXAMINATION – SUMMER 2016

SUBJECT: MACHINE DESIGN II (181902) (ME)

DATE: 23-02-2016 TIME: 02:00 pm to 03:15 pm TOTAL MARKS: 30

Instructions:
1. All the questions are compulsory.
2. Figures to the right indicate full marks.
3. Assume suitable data if required.

Q.1 Answer the Following: [08]
   (a) Explain different modes of gear teeth failures, stating their reasons and remedies.
   (b) Write the main components of IC Engine with their functions.

Q.2 Design a pair of spur gears with 20° full-depth involute teeth having number of teeth on pinion is 18 based on the Lewis equation. Consider velocity factor dynamic load. Pitch line velocity is 5 m/s for initial design consideration. The pinion shaft is connected to a 10kW, 1440 rpm motor. The starting torque of the motor is 150% of the rated torque. The speed reduction is 4:1. The pinion as well as the gear is made of PCS 40C8 (Sut = 600 N/mm²). The factor of safety can be taken as 1.5 for bending and pitting failure. Design the gear, specify their dimensions and suggest suitable surface hardness for the gear.
   Lewis Form factor is 0.308 for 18 teeth system.

OR

Q.2 A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20°, while the helix angle is 25°. The face width is 40mm and the normal module is 4 mm. The pinion as well as the gear is made of steel 40C8 (Sut = 600 N/mm²) and 300BHN. The service factor and the factor of safety are 1.5 and 2 respectively. Assume that the velocity factor accounts for the dynamic load and calculate the power transmitting capacity of gears.
   \[ Y' = 0.484 - (2.87/z') \quad K = 0.16 \text{[BHN/100]}^2 \]

Q.3 The cylinder of a four stroke diesel engine has the following specifications:
   Brake power = 7.5 kW; Speed = 1400 rpm; Maximum gas pressure = 3.5 MPa; Indicated mean effective pressure = 0.35 MPa; Mechanical efficiency = 80 %;
   The cylinder liner and head are made of grey cast iron (Sut = 260 MPa and \( \mu = 0.25 \)). The factor of safety for all parts is 6. Calculate:
   1. Bore and length of the cylinder liner
   2. Thickness of the cylinder liner (Take, C = 3.2 mm)
3. Thickness of the cylinder head

**OR**

    (b) Discuss the design criteria of piston.
SILVER OAK COLLEGE OF ENGINEERING & TECHNOLOGY

BE - SEMESTER–VIII • MID SEMESTER-I/II EXAMINATION – SUMMER 2016

SUBJECT: PRODUCTION TECHNOLOGY (181903) (ME)

DATE: 24-02-2016 TIME: 02:00 pm to 03:15 pm TOTAL MARKS: 30

Instructions:
1. All the questions are compulsory.
2. Figures to the right indicate full marks.
3. Assume suitable data if required.

Q.1 (a) Draw a neat sketch of a single point cutting tool explaining its complete geometry. [05]
(b) State advantages and limitations of USM. [03]

Q.2 (a) Draw Merchant’s force circle diagram. Derive the equation for frictional force, normal reaction, shear force and normal force. [06]
(b) The following equation for tool life is given for a turning operation
\[ V^{0.13} f^{0.77} d^{0.37} = C \]
A 60 min tool life was obtained while cutting at \( V = 30 \text{m/min}, f = 0.3 \text{mm/rev} \) and \( d = 2.5 \text{mm} \)
Determine the changes in tool-life if the cutting speed, feed and depth of cut are increased by 20% individually and also taken together.

OR

Q.2 (a) What is tool signature and tool life. What are the differences between orthogonal cutting and oblique cutting? [06]
(b) During an orthogonal machining (turning) operation of C-40 steel, the following data were obtained.
1) Chip thickness = 0.45mm
2) Width of cut = 2.5mm
3) Feed = 0.25mm/rev
4) Tangential cut force = 1130N
5) Feed thrust force = 295N
6) Cutting speed = 2.5m/s
7) Rake angle = 10degree
Calculate (1) Force of shear at shear plane
(2) Kinetic co-efficient of friction. [05]

Q.3 (a) Explain the principle of EDM. State characteristics of dielectric fluid. [06]
(b) Describe water jet machining process with the help of neat sketch along with advantages. [05]

OR

Q.3 (a) Describe USM with neat sketch. Discuss how the following factors affects the material removal rate of USM-
a) Grain size b) Feed force c) Hardness ratio [06]
(b) With neat sketch explain the process of ECG. [05]
SILVER OAK COLLEGE OF ENGINEERING & TECHNOLOGY

BE - SEMESTER-VIII • MID SEMESTER-I EXAMINATION – SUMMER 2016

SUBJECT: THERMAL ENGINEERING (181904) (ME)

DATE: 25-02-2016 TIME:02:00 pm to 03:15 pm TOTAL MARKS:30

Instructions: 1. All the questions are compulsory.
2. Figures to the right indicate full marks.
3. Assume suitable data if required.

Q.1 (a) Define following terms: [03]
(1) Critical Pressure
(2) Mach Number
(3) Degree of undercooling
(b) Explain Condition for maximum discharge through a Nozzle? [05]

Q.2 (a) Explain types of Nozzle with neat sketches? [06]
(b) Explain metastable flow with h-s diagram? [05]

OR

Q.2 (a) Describe Nozzle Efficiency with help of h-s diagram? [06]
(b) Explain the effects of variation in Back pressure Turbine? [05]

Q.3 (a) Classify Gas Turbine? [05]
(b) Explain Ideal Brayton cycle with the help p-v & T-s diagram? [06]

OR

Q.3 (a) Describe simple open cycle Gas Turbine? [06]
(b) A gas turbine installations works on Brayton cycle between the [05]
temperature limits of 35°C and 715°C. For the maximum work to be [05]
developed, calculate temperature at the end of compression, pressure ratio [05]
and thermal efficiency.
SILVER OAK COLLEGE OF ENGINEERING & TECHNOLOGY

BE - SEMESTER-VIII • MID SEMESTER-I EXAMINATION – SUMMER 2016

SUBJECT: Industrial Safety and Maintenance Engineering (181905)(ME)

DATE: 26-02-2016 TIME:02:00 am to 03:15 pm TOTAL MARKS:30

Instructions:
1. All the questions are compulsory.
2. Figures to the right indicate full marks.
3. Assume suitable data if required.

Q.1 (a) Explain role of management in industrial safety. [04]
(b) Explain Equipment Life Cycle. [04]

Q.2 (a) What is industrial safety? How it is associated with risk? [06]
(b) Explain in brief (1) MTBF (2) MTTR [05]

OR

Q.2 (a) What is Reliability, Maintainability and Availability? [06]
(b) Explain role of government in industrial safety. [05]

Q.3 (a) Draw organization structure of safety committee. Write required characteristics of safety manager. [06]
(b) What are basic principles of maintenance planning? [05]

OR

Q.3 (a) Safety at Work Increase Productivity of Industry: Justify [06]
(b) Discuss the major causes for equipment breakdown.. [05]