Code: 9A03604

R09

B.Tech III Year II Semester (R09) Supplementary Examinations December/January 2015/2016

REFRIGERATION & AIR CONDITIONING

(Mechanical Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

Use of steam tables, P-H charts and Psychrometric charts is permitted in the examination hall

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1 (a) With a neat sketch explain reversed Brayton cycle?

(b) 500 kgs of fruits are supplied to a cold storage at 20^{o}C. The cold storage is maintained at –5^{o}C and the fruits get cooled to the storage temperature in 10 hours. The latent heat of freezing is 105 KJ/kg and specific heat of fruit is 1.256 kJ/kg. Find the refrigeration capacity of the plant.

2 (a) Describe the mechanism of a Simple Vapour Compression refrigeration system? Explain each point.

(b) Explain with a neat sketch Wet and Dry compression.

3 (a) Define a refrigerant. How are refrigerants classified?

(b) Differentiate between primary and secondary refrigerants.

4 (a) What is the basic function of a compressor in Vapour Compression system? How this function is achieved in vapour absorption refrigeration system?

(b) In a vapour absorption refrigeration system heating, cooling and refrigeration takes place at the temperatures of 100^{o}C, 20^{o}C and –5^{o}C respectively. Find maximum C.O.P of the system.

5 A steam-jet refrigeration system receives dry saturated steam at 6 bar. It expands through nozzle down to flash chamber pressure meant to chill water at 50°C. Take η_n = 0.92, η_e = 0.6 and η_c = 0.76. Calculate (i) COP. (ii) Tonnage for 2 kg/s evaporation of water. (iii) Amount of water. (iv) Motive steam/ton of cooling. (v) Volume of steam. Assume condenser temperature as 35^{0}C and make up water to be at 30^{0}C.

6 (a) What is a sling psychrometer? Make a neat sketch and explain its use.

(b) What is the difference between wet bulb temperature and thermodynamic wet bulb temperature?

7 A laboratory has 27 kW sensible and 23 kW latent heat loads. The inside design conditions of air are 20^{0}C DBT and 53% R.H. and outside design conditions of air are 38^{0}C DBT and 25^{0}C WBT. The ventilation air used is 76 m^{3}/min. A cooling coil with a bypass factor of 0.06 must be used. An apparatus DPT is 8^{0}C. Determine:

(a) Amount of reheat required.

(b) Supply air quantity.

(c) DBT and WBT of air entering and leaving the apparatus.

(d) Supply air temperature.

8 An air conditioned space is maintained at 27^{0}C DBT and 50% RH. The ambient conditions are 40^{0}C DBT and 27^{0}C WBT. The space has a sensible heat gain of 14 kW. Air is supplied to the space at 7^{0}C saturated. Calculate: (i) Mass of moist air supplied to the space in kg/h. (ii) Latent heat gain of space in kW. (iii) Cooling load of the air washer in kW, if 30% of the air supplied to the space is fresh, the remainder being recirculated.

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