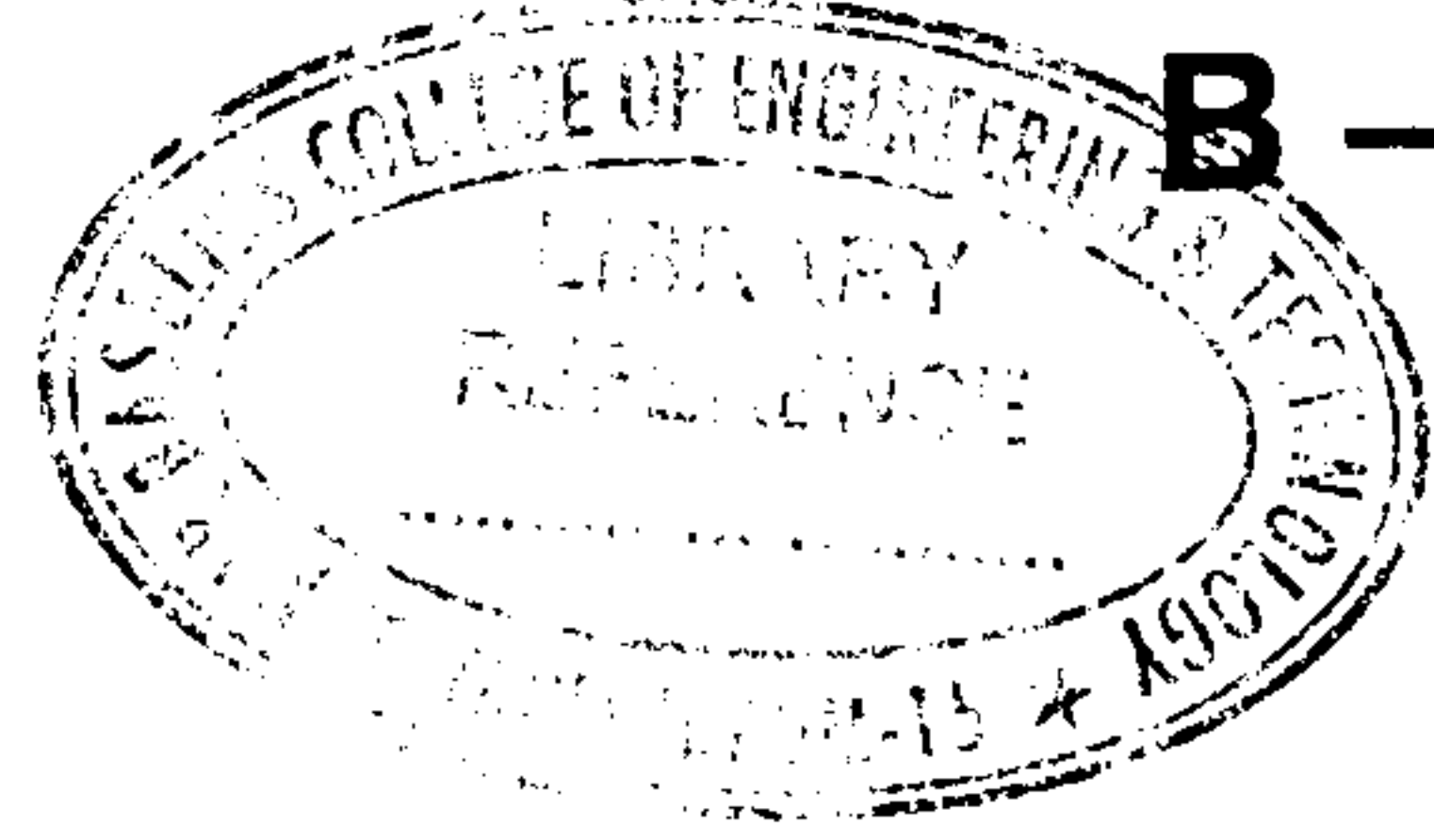




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B – 3445

Reg. No. :

Name :

**Seventh Semester B.Tech. Degree Examination, December 2016
(2013 Scheme)**

13.704 : REFRIGERATION AND AIR CONDITIONING (M)

Time : 3 Hours

Max. Marks : 100

Instructions : 1) *Use of psychrometric chart and refrigeration properties table permitted.*

2) *Answer all questions from Part A and any four full questions from Part B.*

PART – A

Answer **all** questions; **each** question carries **2** marks.

1. What is the principle of producing cold by adiabatic demagnetization technique ? Explain the concept of it.
2. Draw reversed Carnot cycle in T-s diagram indicating various processes.
3. With neat sketches describe the principle of working of Vortex tube refrigerator.
4. Draw the P-h diagram of a simple vapour compression refrigeration system showing various processes in it.
5. Mention any two desirable thermodynamic properties of refrigerants.
6. What do you mean by quick freezing ?
7. Write a method of testing ammonia and Freon group of refrigerant leakage.
8. Distinguish between specific humidity and relative humidity.
9. What are GSHF and RSHF lines ? How do you draw them in the psychrometric chart ?
10. Define Bypass factor of cooling coil in air-conditioning system. **(10×2=20 Marks)**

P.T.O.



PART – B

Answer **any one full** question from **each** Module; **each** carries **20** marks.

Module – I

11. a) Ice is formed at 0°C from water at 20°C the temperature of the brine is -8°C . Find out the kg of ice formed per kWhr. Assume that the refrigeration cycle used is perfect reversed Carnot cycle. Take latent heat of fusion of ice as 335 kJ/kg . 10
- b) Explain with neat sketches the working of regenerative type air refrigeration systems. Where this type of air refrigeration system is used ? 10

OR

12. a) Describe with neat sketches the working of reduced ambient type of air-craft refrigeration system. 10
- b) A Bell-Coleman refrigerator is required to produce 6 tonnes of refrigerating effect with a cooler pressure of 11 bar and a refrigerated space or region at a pressure of 1.05 bar. The temperature of air leaving the cooler is 38°C and air leaving the room is 16°C .
- Calculate :
- i) Mass of air circulated per minute
 - ii) Compressor displacement required per minute
 - iii) Expander displacement required per minute
 - iv) COP and
 - v) Power required per tonne of refrigeration. 10

Module – II

13. a) Show the arrangement of at least two different schemes of arranging multiple evaporator and multi stage compression with flash intercooling. 10
- b) What are the methods of improving COP of a simple saturated vapour compression refrigeration cycle ? Explain with supportive P-h diagrams. 10

OR



14. a) i) Distinguish between flash gas removal and flash intercooling processes as applied to multi-pressure systems. Explain with sketches. **6**
- ii) What are the effects of flash intercooling in NH₃ refrigeration systems and R12 refrigeration systems ? Explain. **4**
- b) A food storage locker requires a refrigeration capacity of 50 kW. It works between condenser temperature of 35°C and an evaporator temperature of – 10°C. The refrigerant is ammonia. It is sub cooled by 5°C before entering the expansion valve by the dry saturated vapour leaving the evaporator. Assuming a single-cylinder single-acting compressor operating at 1000 rpm with the stroke equal to 1.2 times the bore,
- Determine :
- i) the power required, and
- ii) the cylinder dimensions. **10**

Properties of ammonia are :

Saturation temperature °C	Pressure bar	Enthalpy kJ/kg		Entropy kJ/kgK		Specific volume m ³ /kg		Specific heat kJ/kgK	
		Liquid	Vapour	Liquid	Vapour	Liquid	Vapour	Liquid	Vapour
- 10	2.9157	154.056	1450.22	0.82965	5.7550	-	0.417477	-	2.492
35	13.522	366.072	1488.57	1.56605	5.2086	1.7023	0.095629	4.556	2.903

Module – III

15. a) Describe the working of steam jet refrigeration system with neat sketches. **10**
- b) Describe Electrolux refrigeration system with neat sketches. **10**

OR

16. a) Describe with neat sketches the working of domestic refrigerator. **10**
- b) Describe with appropriate sketches any one method of charging of refrigerant into the vapour compression refrigeration system. **10**

**Module – IV**

17. a) Define and derive expressions for the following terms : 10
- 1) Specific humidity
 - 2) Degree of saturation.
- b) 400 m³/min of recirculated air at 20°C DBT and 10°C DPT is to be mixed with 150 m³/min of fresh air at 35°C DBT and 45% RH. Determine the enthalpy, specific volume, specific humidity and dew point temperature of the mixture. 10

OR

18. a) Air at 32°C DBT and 20°C WBT is passed through a cooling coil maintained at 5°C. The heat extracted by the cooling coil from air is 14 kW and air flow rate is 42.5m³/min. Determine :
- i) DBT and WBT of the air leaving the coil and
 - ii) Coil by-pass factor. 10
- b) Write short notes on the following :
- i) Air conditioning of cinema theatre
 - ii) Air conditioning of hospitals. 10

