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AIKTC/KRRC/SoET/ACKN/QUES/2017-18/   Date: _____

School: __SoET-CBSGS__   Branch: __MECH. ENGG.__   SEM: ____VIII____

To,
Exam Controller,

AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following **Semester/Unit Test-I/Unit Test-II (Reg./ATKT)** question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format		No. of Copies
			SC	HC	
1	Design of Mechanical Systems	MEC801		✓	02
2	Industrial Engineering and Management	MEC802		✓	02
3	Refrigeration and Air Conditioning	MEC803		✓	02
4	Elective- II	MEE802X			
5					
6					

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

B.E-sem-VIII - CBGS- Mech   20/11/18

(Hours 3)   [Total Marks: 80]

- Question No. 1 is compulsory.
- Attempt any three questions from the remaining.
- Assumption made should be clearly stated.
- Design Data Book by PSG, Mahadevan, Kale & Khandare are permitted to use.

Q.1   **Answer any four**

(a)   Draw flow chart for design methodology and explain with example.   5

(b)   What is mean by 6 X 37 rope in hoisting mechanism, elaborate with neat sketch.   5

(c)   List different types of piston rings and their functions.   5

(d)   Draw a neat sketch of centrifugal pump and explain its principle of working.   5

(e)   List the various laws of speed range distribution, explain arithmetic progression law   5
        with example.

Q.2 (a) What is cavitation in centrifugal pump? How to avoid it.   5

     (b) For the specification of an EOT Crane ,
          Application   - Class II
          Load to be Lifted   - 100 KN
          Hoisting speed   - 10 m/min
          Maximum Lift   - 5 m

          i.   Design a 6 X 37 type of rope and find its life.   6 8

          ii.   Design hook and check it at most critical cross section.   6 8

          iii.   Select suitable motor for hoisting.   3 6

Q.3 (a) State the advantages of multi fall pulley systems.   4

     (b) Belt conveyor system is to be designed for the following specifications:
          Material conveyed up : Coal
          Capacity : 200 TPH
          Lump size : 80mm
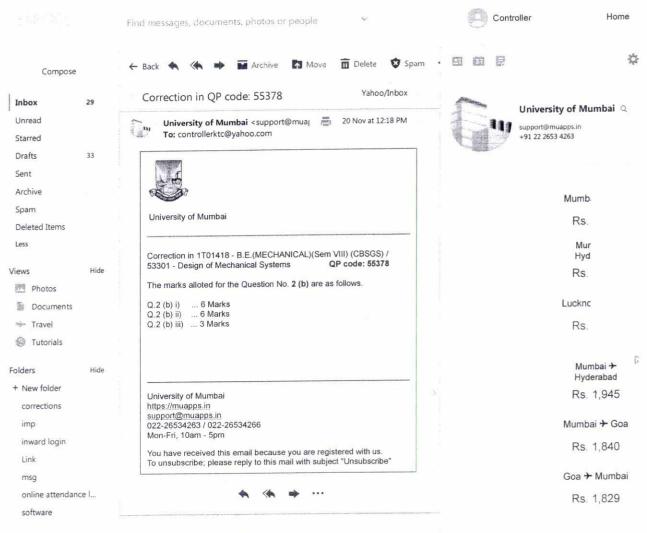   Horizontal distance : 20m
          Vertical distance :3m
          Troughing angle : 15 degree

          i.   Design conveyor belt.   8

          ii.   Select suitable motor for conveyor.   4

          iii.   Design the upper roller and bottom roller.   4

                                                              TURN OVER

Q.4   Design following components of single cylinder, two stroke, and water cooled Petrol Engine to develop 40 KW at a speed of 1000rpm by making suitable assumption and neat sketches. Assume Compression Ratio as 7.

       i.   Find the standard bore and length of a cylinder.   5

       ii.   Calculate the design pressure considering explosion ratio as 3.25 and   5
           FOS as 1.3.

       iii.   Design connecting rod and check it for bending.   10

Q.5   (a)   It is required to design a 2 X 2 machine tool gear box with following specification.   10
N_{min} = 100rpm, N_{motor} = 960 rpm, GP ratio = 1.26

       i.   Draw structural diagrams,
       ii.   Draw ray diagram and speed chart,
       iii.   Find the number of teeth of each gear.

    (b)   A centrifugal pump is required to design for the total manometric head of 20 m and discharge of 900LPM of water at room temperature.

       i)   Find the inlet and outlet diameter of an Impeller of the centrifugal pump.   6
          (Draw neat sketch of impeller and assume $D_2 = 2D_1$)

       ii)   Find the inlet and outlet diameter of pipes.   4

Q.6   A Gear Pump required to deliver 75LPM of SAE20 oil at a pressure of 120 bar. By making suitable assumption,

       i.   Select suitable standard Motor.   3

       ii.   Select suitable flexible bush pin coupling.   3

       iii.   Design gear and check for bending failure.   10

       iv.   Design casing of the gear pump.   4

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Correction in QP code: 55378   Yahoo/Inbox

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Correction in 1T01418 - B.E.(MECHANICAL)(Sem VIII) (CBSGS) /
53301 - Design of Mechanical Systems   **QP code: 55378**

The marks alloted for the Question No. **2 (b)** are as follows.

Q.2 (b) i)   ... 6 Marks
Q.2 (b) ii)   ... 6 Marks
Q.2 (b) iii)   ... 3 Marks

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(Three Hours)   Total Marks: 80

N. B.: 1. Q. No. 1 is compulsory.
        2. Attempt any THREE questions from the remaining questions.
        3. Assume suitable data wherever necessary.
        4. Figures to the right indicate full marks.

Q.1 Write Short note on. (Any Four)   (20)
    a. Productivity Improvement Techniques
    b. Role of Industrial Engineer
    c. Plant Layouts and Planning
    d. Importance of Ergonomics in the work-process layout
    e. Merit Rating
    f. Time Value of Money

Q.2 a) Define productivity. Why productivity is important in production management.   (10)

b) Explain the Micro and Macro Motion Study techniques in detail.   (10)

Q.3 a) Explain THERBLIGs in detail with the symbols used and the inference drawn.   (10)

b) Draw and Explain Outline Process Chart, construction, usage, inference for the replacement of spark plug.   (10)

Q.4 a) Explain in detail the Group Technology and OPTIZ system for the part coding.   (10)

b) Explain with the help of Dummy data Profit and Loss Account statement and the Balance sheet, their usage and inference.   (10)

Q.5 a) Explain in brief the various accounting methods deployed in asset depreciation analysis.
                                                                                       (10)
b) List various work measurement techniques available and explain any one in detail.   (10)

Q.6 a) Explain in detail the concept of Value Engineering and Value Analysis with the steps in implementation of the same.   (10)

b) The workmen in an engineering firm are expected to work for 400 minutes in a shift of 8 hours. The remaining time is meant for rest and personal needs, etc.   (10)
    i) Estimate the standard time per piece of a job whose normal time is 2 minutes.
    ii) Find number of pieces to be produced per day.
    iii) If the workmen engaged on the above job produced 180 pieces in the shift, what is their efficiency?

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Paper / Subject Code: 53303 / Refrigeration & Air Conditioning

(Revised course)

(3 Hours)   **[Total Marks 80]**

Note: 1) Question no. **1** is compulsory.

2) Attempt any **three** questions out of the remaining **five** questions.

3) Clearly mention the assumptions made if any.

4) Use of Refrigerant tables, P-h Chart, Friction charts, Psychrometric chart, and Steam tables are permitted.

Q 1 Answer any Four of the following: **20**

a) Explain with a neat schematic diagram use of Liquid Suction heat exchanger in a Vapour Compression system.

b) What are eco-friendly refrigerants? Discuss with examples.

c) List down types of aircraft refrigeration systems. How are these systems compared on the basis of DART?

d) A reversed Carnot cycle air conditioner of 1 TR capacity operates with evaporator coil temperature $t_0 = 7\ ^0C$. The surrounding air at 43 ^0C is used as a cooling medium rising to a temperature of 53 ^0C. The temperature of heat rejection is $t_k = 55\ ^0$. Determine COP, power consumption of the air conditioner and the mass flow rate of surrounding air entering the condenser. Take C_p for air as 1.005 kJ/Kg K.

e) Define RSHF, GSHF and ERSHF.

f) Discuss advantages of vapour absorption refrigeration system over vapour compression refrigeration system.

Q 2 a) In a laboratory test, a psychrometer recorded dry bulb temperature as 34 ^0C and   **8**
wet bulb temperature of 26 ^0C. Without using Psychrometric chart, calculate:

i) Vapour pressure   ii) Relative humidity iii) Specific humidity iv) Degree of saturation v) Dew point temperature   v) Enthalpy of mixture

Barometric pressure = 740 mm of Hg

b) What are different types of Cooling Towers ? Explain with a neat sketch an   **6**
Induced Draft type Cooling Tower.

c) What are the sources of cooling load? Explain how will you estimate cooling load   **6**
of your College Library.

Q 3 a) A regenerative air refrigeration system for an aeroplane is designed to take a load   **12** of 25 TR. The temperature and pressure conditions of the atmosphere are 5 C and 0.85 bar. The pressure of the air is increased from 0.85 bar to 1.2 bar due to ramming action. The pressure of air leaving the main compressor is 4.8 bar. 60 % of the total heat of the air leaving the main compressor is removed in the heat exchanger and then it is passed through the cooling turbine. The temperature of the rammed air which is used for cooling purposes in the heat exchanger is reduced to 50 C by mixing the air coming out from the cooling turbine. The isentropic efficiencies of the compressor and turbine are 90 % and 80 % respectively. The pressure and temperature required in the cabin are 1 bar and 25 C respectively. Assuming isentropic ramming and mass of cooled air passing through the heat exchanger equal to the mass of cooling air , find ; i. the ratio of by-passed air to ram air used for cooling purposes ; and ii. the power required for maintaining the cabin at required condition.

b) Discuss with a block diagram triple fluid Vapour Absorption refrigeration system.   **4**

c) Explain with the help of a neat sketch, the working of a refrigerating system   **4** having three evaporators at different temperatures with individual compressors and multiple expansion valves.

Q 4 a) A vapour compression system using NH_3 works between $- 15\ ^0C$ and $40\ ^0C$ **10** as evaporator and condenser temperature respectively. The vapour is superheated by $5\ ^0C$ before entering compressor and liquid is subcooled by $5\ ^0C$. Using P-h chart determine :

     i) COP
     ii) Mass flow of refrigerant per TR
     iii) Piston displacement per TR using volumetric efficiency $= 80\ \%$
     iv) Heat rejected in the condenser per TR; and
     v) Ideal COP

b) Draw front and side view of a Window Air Conditioner and explain the various   **6** components inside the Unit.

c) What are the methods of duct design? Explain any one method in detail.   **4**

Q 5 a) The following data refer to an air conditioned space: **14**

Outdoor condition	$38\ ^0C$, 50 % RH
Room condition	$24\ ^0C$, 50 % RH
Sensible heat load	26 kW
Latent heat load	8 kW
By-pass factor of the cooling coil	0.16

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If the ventilation requirement is such that on mass flow rate basis, 20 % of fresh air is introduced and 80 % of supply is recirculated, determine:

    i) Supply air flow rate
    ii) Outside air sensible heat
    iii) Outside air latent heat
    iv) Grand total heat
    v) Effective room sensible heat factor

b) Discuss in details various controls used in a Central Plant Air Conditioning system,   **6**

Q 6   Write short notes on any **four** of the following: **20**

a) Types of Condensers and Evaporators
b) Thermoelectric Refrigeration
c) Year round Air Conditioning System
d) Pressure and Temperature Controls
e) BEE Star Rating System
f) Bootstrap Cooling System