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7E4060

7E4060

B.Tech. VII Semester (Main) Examination - 2013
Common for Mechanical Engineering P.&I
7ME1 & 7PI6.3 Computer Aided Design

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 24

Instructions to Candidates:

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

Unit - I

1. a) Explain different types of coordinate systems. (8)
- b) Differentiate raster scan and random scan. (8)

OR

1. a) Illustrate the Bresenham's line drawing algorithm using a line having end points (10,5) and (15,9). (8)
- b) Scan convert a circle whose centre is (10,20) and the radius is 10 units using Bresenham's algorithm. (8)

Unit - II

2. a) Explain wire frame modeling with suitable examples. (8)
- b) Derive parametric representation equation for line and ellipse. (8)

OR

2. a) Derive parametric representation equation for Bezier curve. (8)
- b) Write short note on blending of curves. (8)

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Unit - III

3. a) Differentiate between E-rep and CSG. (8)
- b) Derive parametric representation of hermite bi-cubic surface. (8)

OR

3. a) Derive parametric representation of Bezier surface. (8)
- b) Differentiate wire frame model, surface model and solid model. (8)

Unit - IV

4. a) A sphere having centre (10,10,10) and radius 8 units is translated by 3 units in x-direction and 5 units in z-direction. Then it is rotated by 45° in anticlockwise direction about y-axis. Find the new centre of the sphere. (10)
- b) Explain parallel and perspective projection. (6)

OR

4. a) A line having end points (31,3,76) and (5,11,80) is rotated about x-axis, keeping point (31,3,76) as fixed by an angle of 30° in clockwise direction. Find the new coordinates of the line. (10)
- b) Explain 3D reflection and rotation. (6)

Unit - V

5. Explain various methods of line clipping. (16)

OR

5. Explain hidden line and surface removal algorithm. (16)
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7E4061	Roll No. _____	[Total No. of Pages : 4]
7E4061		
B. Tech. VII Semester (Main) Examination-2013		
Mechanical Engineering		
7ME2 Refrigeration & Air Conditioning		

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 24

Instructions to Candidates:

Attempt any **five** questions, selecting **one** question from **each** unit. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly)

Use of following supporting material is permitted during examination.

1. Steam Table
2. Psychometric Chart

Unit - I

1. a) Discuss the actual vapour compression cycle with the help of P-h and T-S diagram. (8)
- b) A refrigerator's storage is supplied with 3600kJ of a substance at a temperature of 27°C. A substance has to be cooled at -23°C. The cooling is about 10 hours. The specific heat of substance is 2kJ/Kg-K above freezing point and 0.5kJ/Kg-K below freezing point. The freezing point of a substance is -3°C. The latent heat of freezing is 230kJ/Kg. What is the power required to drive the plant in kW if the actual COP is the half of ideal COP? (8)

OR

1. A vapour compression refrigeration system has the following data.

Capacity	= 15 TR
Evaporator Temperature	= -10°C
Condenser Temperature	= 30°C
Temperature of refrigerant superheated as vapour in evaporater is	= -5°C
Temperature of refrigerants superheated as liquid in condenser	= 25°C
No.of cylinder	= 2
Stroke	= 1.2 times
Speed	= 960 rpm
Specific heat of liquid	= 0.963kJ/Kg-K
Specific heat of vapour	= 0.615 kJ/Kg-K

Find the following:

 - a) Refrigeration effect per Kg
 - b) Mass flow rate of refrigerants per minute

- c) Theoretical piston displacement per minute
- d) Theoretical power in kW
- e) COP
- f) bore and stroke of compressor
- g) Volumetric efficiency

Take specific heat of liquid as 0.963 kJ/Kg-K and specific heat of vapour as 0.615 kJ/Kg-K (16)

Unit - II

2. a) Why isentropic expansion is used in gas refrigeration cycle instead of throttling? (8)
- b) If the temperature at the end of heat absorption and heat rejection are 0°C and 30°C respectively, $\gamma_p = 4$. Determine the temperature at all the point and also find volume flow rate of refrigerants at the inlet to the compressor and exit of the expander. The cooling capacity of the plant is 1 TR and pressure at the inlet to the compressor is 1 bar. (8)

OR

2. a) Air is used as refrigerants in a reversed brayton cycle. Draw T-S and P-V diagram for this cycle and derive the expression for COP in terms of pressure ratio (γ_p). (8)
- b) A gas refrigeration system working on reversed brayton cycle as a temperature of 250K at the inlet of the compressor. If the temperature at the end of constant pressure cooling is 300K and raising the temperature of air in refrigerator is 50K , then find the net work out? (Take $C_p = 1 \text{ kJ/Kg-K}$) (8)

Unit - III

3. a) Name three refrigerants that are commonly used in commercial refrigerants. Discuss their relative merits and demerits. Which of these refrigerants would you recommend?
 - i) For an air conditioning plant of sealed types of 5 tons capacity.
 - ii) A domestic refrigerator.
 - iii) An ice plant
- b) In an aqua - ammonia absorption system heat is supplied to the generator by condensing steam at 0.25 mpa and 0.9 dryness fractions. The temperature to be maintained at refrigeration is -10°C and ambient temperature is 30°C . Find the maximum COP of refrigeration if the actual COP is 40% of maximum (6)

COP and the refrigeration load is 20TR. What will be the steam flow rate if the steam condenses completely to saturated liquid at 0.25 mpa. The saturation temperature is 120.2°C and HFG ($H_g - H_f$) = 220.19 kJ/Kg (10)

OR

3. a) Draw a neat diagram of Electrolux refrigeration and explain its working principle. What is the important role of hydrogen in refrigeration systems? (8)
- b) A vapour absorption refrigeration system comes with generator, ambient and evaporator temperature as 360K, 310K and 260K respectively. Find the maximum COP? If the evaporator temperature falls to 250K, what should be the generator temperature in order to operate the system with same COP? (8)

Unit - IV

4. a) What is thermal comfort? Explain the typical condition of thermal comfort with the help of bioclimatic chart? (8)
- b) Moist air at 1.013 bars and 30°C contains 10gm of water vapour per Kg dry air. Assuming that air and water vapour mixture behaves as an ideal gas and the saturation pressure of vapour at 30°C is 3.167 Kpcal. Find the relative humidity of air? (8)

OR

4. The DBT and WBT of moist air are 30°C and 20°C respectively. The atmospheric pressure is 0.9865 bars, find.
- Relative humidity
 - Specific humidity
 - Vapour density
 - Enthalpy of moist air.

Use the following empirical relation.

$$P_v = P'_v - \frac{1.84P'_v(DBT - WBT)}{2700}$$

Where P'_v is saturation pressure of vapour corresponding to wet bulb temperature:

Temperature (°C)	Saturation Pressure
30	0.04242 bar
20	0.237 bar

(16)

Unit - V

5. a) What is heat load? Show the various step of heat load calculation by taking a suitable example. (8)

b) Write short notes on following:

- i) Effect of bypass factor
- ii) Occupancy and Appliances load

(8)

OR

5. A laboratory having an unusually large latent heat gain is required to be air conditioned. The design condition and load are as follows:

Summer design conditions : 40°C DBT, 27°C WBT

Inside design conditions : 25°C DBT, 50% RH

Room sensible heat : 34.9 kW

Room latent heat : 18.6 kW

The ventilation air requirement is 85 cmm. Determine the following:

- i) Ventilation load
- ii) Room and effective sensible heat factors
- iii) Apparatus dew point and amount of reheat for economical design.
- iv) Condition of air entering and leaving coil and supply air temperature.
- v) Grand total heat

Assume a suitable bypass factor.

(16)

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B.Tech. VII Semester (Main) Examination - 2013
Mechanical Engg.
7ME3 Operations Research

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **five** questions, selecting **one** question from each **unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

Use of following supporting material is permitted during examination.

1. Normal Probability Table.

Unit - I

1. a) RTU plans to admit students for Engineering Science Stream (called stream A) and Management-Humanities Stream (called stream B). These are to be admitted from among the candidates who have passed Higher Secondary examination. The institute has stations to interview candidates at Delhi, Kolcutta and Chennai. The candidates called for interview have passed higher secondary examination mainly from central Board, West Bengal Board and Tamil Nadu Board. The students have also been called for interview from offer boards.

Table 1:

Stn	Max No. called for Interview	Percentage of students from Boards				Total Expenditure Rs.
		Central	West Bengal	Tamil Nadu	Others	
Delhi	3000	50	10	10	30	3000
Kolcutta	2500	40	40	10	10	4000
Chennai	2000	40	10	40	10	5000

It is assumed that all candidates called for Interview appear before Interview Board. It is decided to form the stream A and B according to the following specifications.

A should contain:

At least 50% from Central Board.

At most 50% from Tamil Nadu Board.

At most 30% from others Board.

B should contain:

At most 70% from central Board.

At most 50% from West Bengal Board.

between 40% and 60% from other Board.

The students admitted to stream A and stream B have to pay Rs.300/- and Rs.200/- respectively as admission fee. Formulate a LPP which makes best use of available information. (8)

b) Consider the problem

$$\text{Max. } Z = 8x_1 + 9x_2$$

$$\text{S.t. } 5x_1 + 4x_2 \leq 40$$

$$x_1 + 2x_2 \leq 12$$

$$5x_1 + 19x_2 \leq 95 \quad x_1 \geq 0, x_2 \geq 0$$

If optimal table (simplex) is

Table 2

X_B	x_1	x_2	s_1	s_2	s_3	b
s_3	0	0	3/2	-25/2	1	5
x_1	1	0	1/3	-2/3	0	16/3
x_2	0	1	-1/6	5/6	0	10/3
z-c _j	0	0	7/6	13/6	0	218/3

Using above table find the solution of the problem obtained from the above by replacing its second constraint by $x_1 + 2x_2 \leq 6$ (8)

OR

1. a) Estate Department has purchased sufficient amount of curtain cloth to meet the curtain requirement of the institute. The curtain cloth is in pieces, each of length 14 feet. The curtain requirement is as follows.

Curtains of length (in feet)	No. required
4	1500
6	1000
8	3000

The problem is how to cut the pieces, to meet the above requirement so that the trim loss is minimized. The width of required curtains is same as that of available pieces. (8)

- b) Using Table 2 (Q 1(b)) find the solution of the problem (Q 1(b) above) obtained by replacing the first constraint by $4x_1 + 5x_2 \leq 40$. (8)

Unit - II

2. a) Solve the following transportation problems with transshipment. (8)

	D ₁	D ₂		S ₁	S ₂
S ₁	2	4	100	0	1
S ₂	4	6	250	1	0
	200	200			

	D ₁	D ₂
D ₁	0	2
D ₂	2	0

- b) Find an optimal solution to an assignment problem with the following cost matrix. (8)

	J_1	J_2	J_3	J_4
M_1	10	9	7	8
M_2	5	8	7	7
M_3	5	4	6	5
M_4	2	3	4	5

OR

2. Solve the following problem using Dynamic Programming Methodology.

$$\text{Min } Y = Y_1^2 + Y_2^2 + Y_3^2$$

$$\text{Subject to } y_1 y_2 y_3 = 6$$

$$y_i > 0 \quad \text{and integers.}$$

(16)

Unit - III

3. Solve the following problem.

$$\text{Max } Z = 3x_1 + 2x_2$$

$$\text{Subject to } x_1 \leq 2$$

$$x_2 \leq 2$$

$$x_1 + x_2 \leq 3.5$$

$$x_1, x_2 \geq 0 \quad \text{and integer.}$$

(16)

OR

3. The Rodney Sportswear company has designed two new tennis short styles for next year, "Wimbledon" and "Forest Hills". The company can produce either or both or neither of the two styles. Thus management must select one of four actions available. (a) "Wimbledon" only, (b) "Forest Hills" only (c) both, or (d) neither. The cost of production, all of which must be borne in advance if a model design is to be produced, is \$50,000 for either of the models but it is \$125,000 for both together because of the strain on capacity involved in producing two styles. The

profit, including all income and costs except production cost, is \$ 100,000 per style if the style is successful, and zero if the style is unsuccessful. Assuming that each tennis short style has a 50% chance of being commercially successful and is independent of the success or failure of the other style, what is the best course of action? (16)

Unit - IV

4. Speedy wheels is a wholesale distributor of bicycles. Its Inventory Manager, Ricky Sapolo, is currently reviewing the inventory policy for one popular model that is selling at the rate of 250 per month. The administrative cost for placing an order for this model from the manufacturer is \$ 200 and the purchase price is \$ 70 per bicycle. The annual cost of the capital tied up in inventory is 20% of the value (based on purchase price) of these bicycles. The additional cost of storing the bicycles-including leasing ware house space, insurance, taxes and so on - is \$ 6 per bicycle per year.

- (16)
- a) Determine the optimal order quantity and the total variable inventory cost per year.
 - b) After consultations with management Ricky estimates that the annual shortages cost (Including lost future business) would be \$ 30 times the average no. of bicycle short throughout the year. Determine the new optimal inventory policy with planned shortages. (16)

OR

(16)

4. A drug store orders copies of a popular monthly magazine at a cost of 75 cents per copy. At the end of the month, when the next issue is delivered, any left over copies can be returned to the distributor for a credit of 25 cents. The cover price of the magazine is \$ 1.50. Monthly demand for the magazine can be regarded as normally distributed with a mean of 50 copies and a standard deviation of 15. How many copies should the store order. (16)

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Unit - V

5. Ships arrive at a port at the rate of one in every 4 hours with exponential distribution of inter arrival times. The time a ship occupies a berth for unloading has exponential distribution with an average of 10 hours. If the average delay of ships waiting for berths is to be kept below 14 hours, how many berths should be provided at the port? (16)

OR

Instructions to Candidates:

5. A coffee house in a busy market operates counter service. The proprietor of the coffee house has approached you with the problem of determining the number of counter bearers he should employ at the counter. He wants that the average waiting time of the customer should not exceed 2 minutes. After recording the data for a number of days, the following frequency distribution of Inter-arrival time of customers and the service time at the counter are established. (16)

Inter arrival time (minutes)	Frequency (%)	Service time (minutes)	Frequency (%)
0	5	1.0	5
0.5	35	2.0	25
1.0	25	3.0	35
1.5	15	4.0	20
2.0	10	5.0	15
2.5	7		
3.0	3		

Simulate the system for 30 arrivals for various alternative no. of bearers and determine the suitable answer to the problem.

RNs for arrival: 0, 48, 51, 06, 22, 80, 56, 06, 92, 51, 13, 65, 60, 51, 50, 13, 94, 47, 26, 78, 33, 60, 31, 64, 89, 64, 44, 83, 28, 71.

RNs for service time: 31, 46, 24, 54, 63, 82, 32, 14, 63, 18, 52, 82, 03, 62, 22, 61, 29, 30, 24, 69, 54, 66, 46, 37, 18, 68, 86, 37, 82, 48.

At most 30% from others Board.

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Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 24

Instructions to Candidate:

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7E4063

7E4063

B.Tech. VII Semester (Main/Back) Examination - 2013**Mechanical Engg.****7ME4 Steam Turbines & Steam Power Plant****Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks : 24****Instructions to Candidates:**

Attempt any **five** questions, selecting **one** question from each **unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205).

1. Calculator
2. Steam Table/Mollier diagram

Unit - I

1. With the help of velocity diagram, show that the optimum value of the ratio of blade speed to steam speed (for maximum efficiency) for a single stage impulse turbine is $\cos(\alpha_1/2)$. Where α_1 is steam inlet angle. Also obtain an expression for maximum efficiency. (5)

OR

1. In a single impulse turbine the nozzles are inclined at 20° to the direction of motion of moving blades. The steam leaves the nozzle at 375 m/s. The blade velocity is 165 m/s. Calculate suitable inlet and outlet angles for the blade in order that the axial thrust is zero. The relative velocity of steam as it flows over the blades is reduced to 15% by friction. Also determine the power developed for a flow rate of 10kg/s. (16)

Unit - II

2. a) Explain in detail the need of governing in steam turbines and its types.
b) Explain the special form of steam turbines. (16)

OR

2. Following data related to stage of a reaction turbine; Mean rotor diameter = 1.5 m; speed ratio = 0.72 ; blade outlet angle = 20° ; rotor speed = 3000 rpm determine.

- i) The diagram efficiency.
- ii) The percentage increase in diagram efficiency and rotor speed if the rotor is designed to run at best theoretical speed, the exit angle being 20° . (16)

Unit - III

3. With the help of T-S and systematic diagram explain the principle of regenerative cycle and calculate the expression for its thermal efficiency, also discuss advantages and disadvantages. (16)

OR

3. With the help of T-S and systematic diagram explain the principle of reheat cycle and calculate the expression for its thermal efficiency, also discuss its reheat factor in multistage turbine. Write its advantages and disadvantages. (16)

Unit - IV

4. The steam is supplied to a three stage turbine at 30 bar and 350°C . This steam leaves the first stage at 7 bar; second stage at 1 bar and finally at 0.1 bar. If each stage has an efficiency of 0.7, determine
 - 1) Rankine efficiency.
 - 2) Final condition of steam.
 - 3) Reheat factor
 - 4) Overall efficiency. (16)

OR

4. a) Explain the compounding of impulse turbine in detail and also draw their diagrams.
- b) Explain internal losses in turbines. (16)

Unit - V

5. a) Give the layout of modern layout of modern steam power plant and its essential requirements.
- b) What factors should be taken into consideration while selecting the site for steam, power plant? (16)

OR

5. Enumerates the means by which coal from the coal mines can be transported and what are the requirements of good coal handling plant? Also explain the steps involved in good coal handling. (16)

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7E4064

B.Tech. VII Semester (Main) Examination - 2013
Mechanical Engineering
7ME5 Product Development & Launching

Time : 3 Hours**Maximum Marks : 80****Min. Passing Marks : 24****Instructions to Candidates:**

*Attempt any **five** questions, selecting **one** question from each **unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

Unit - I

- Using suitable example explain importance of new product development for the growth of an enterprise. Explain generic product development process for market full product using suitable example. (8+8=16)

OR

- Define steps involved in new product development process. Also explain responsibilities involved in new product development. (8+8=16)

Unit - II

- Using a suitable example explain the importance of need identification and its analysis in the product development process. Also show steps involved in it. (8+8=16)

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OR

2. Explain problem formulation process using a suitable example. Using suitable example develop engineering statement of the problem and establish its target specification. (8+8=16)

Unit - III

3. Define "Creativity" and explain significance and importance of creativity in product development process. (8+8=16)

OR

3. Explain 'Concept Feasibility' and 'Concept Selection' using suitable examples. Discuss any three tools of creativity. (8+8=16)

Unit - IV

4. Using suitable example explain steps involved in detailed design phase of product development. Also explain using a suitable example the input and output of this phase. (8+8=16)

OR

4. Using suitable example explain in detail step involved in:
- Review of product design from the point of view of manufacturing.
 - Review of product design from the point of view of ergonomics. (8+8=16)

Unit - V

5. Using suitable example explain:

a) Project task Matrix.

b) Project scheduling.

(8+8=16)

OR

5. Discuss challenges faced by management in launching a new product. Using suitable examples explain and discuss in detail strategies involved in project execution and product evaluation. (8+8=16)
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7E4065

7E4065

B.Tech. VII Semester (Main/Back) Examination - 2013**Mechanical Engg.****7ME6.1 Robotics****Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks : 24****Instructions to Candidates:**

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

Unit - I

1. a) Discuss about the Progressive Advancement in Robots by giving suitable examples. (8)
- b) Discuss about various characteristics of Robots. (8)

OR

1. a) Explain in brief about various design and control issues for Robots. (8)
- b) Write short note on Programming Robots and also give name of various programming methods of Robots. (8)

Unit - II

2. a) Explain the description of objects in space with the help of neat sketches. (8)
- b) Explain differential motions of a frame in the field of Robotics. (8)

OR

2. a) Explain the monogeneous transformation matrix and interpret the partitioning with application. (8)
- b) Explain in details about the transformation of vectors. (8)

Unit - III

3. a) Discuss about homogeneous transformation matrices. (8)
- b) Explain the representation of transformation in various forms. (8)

OR

3. Explain the Kinematic Modeling of Manipulator by using suitable sketches. (16)

Unit - IV

4. a) Explain various characteristics of sensors used in Robotic system. (8)
 b) Explain following in relation to Robotics.
 i. What is image.
 ii. Acquisition of images. (4×2)

OR

4. Write short notes on following sensors including applications and examples.
 a) Position Sensors.
 b) Force and Pressure Sensors.
 c) Proximity Sensors.
 d) Light and Infrared Sensors. (4×4)

Unit - V

5. a) Discuss in short about various non-industrial applications of Robot. (8)
 b) Explain the principles of robotic applications according to present scenario. (8)

OR

5. a) Write short note on Industrial applications of Robots. (8)
 b) Explain Processing application of Robots in industries by taking suitable example. (8)
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