

7E7011	Roll No. _____	[Total No. of Pages : 4]
	7E7011	
	B.Tech. VII Semester (Main) Examination , Nov./Dec.- 2015	
	Mechanical Engineering 7ME1A Finite Element Methods (Common With PI)	

Time : 3 Hours

Maximum Marks : 80

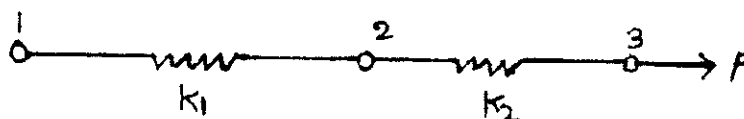
Min. Passing Marks : 24

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) Find deflection of nodes 2 and 3 for the system shown in figure. Develop global stiffness matrix. (10)



- b) Discuss banded symmetric matrix and band width with suitable example. (6)

OR

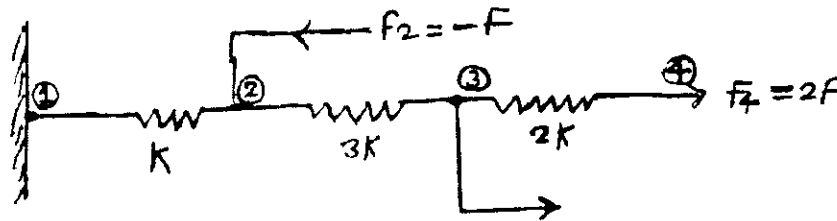
1. a) Solve following system of simultaneous equations by Gauss - elimination method. (6)

$$x + y + z = 9$$

$$x - 2y + 3z = 8$$

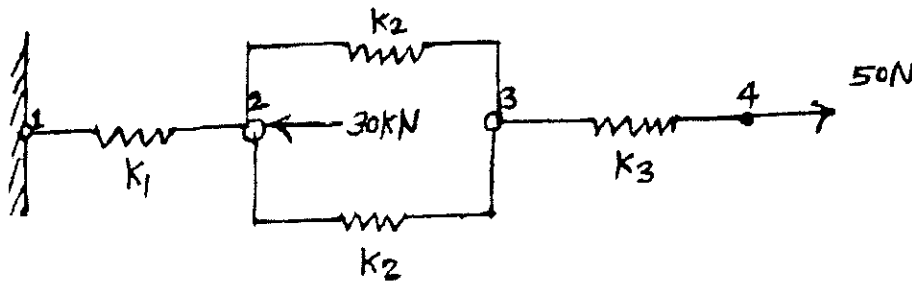
$$2x + y - z = 3$$

- b) Determine the displacement of each node and force required at node 3 for specific conditions as follows:- (10)



Unit - II

2. a) Using minimum potential energy approach solve for displacement at 2,3 and 4 and reaction force at node 1 for following node 3 is rigid. (10)



$$K_1 = 40 \text{ N/mm}, K_2 = 60 \text{ N/mm}, K_3 = 30 \text{ N/mm}$$

- b) Explain the terms node and mesh. Also explain Node numbering and its significance. (6)

OR

2. Shape functions satisfy property of consistency i.e. they are able to model rigid body motion and condition of constant strain. Write shape functions for linear and quadratic interpolation for 1D element. Also show that these shape functions are consistent. (16)

Unit - III

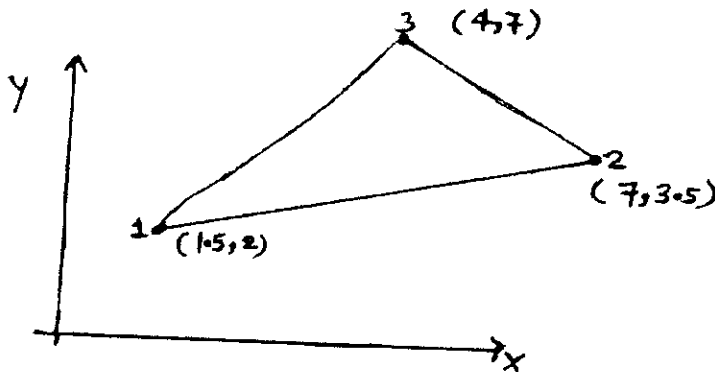
3. a) Evaluate by Gaussian quadrature method. (8)

$$I = \int_1^3 \frac{dx}{x} \text{ by 3 point formula.}$$

- b) Derive shape functions for CST triangular element in local coordinates. (8)

OR

3. Evaluate the shape functions N_1 , N_2 and N_3 at the interior point P for the triangular element as shown in figure.



Also determine Jacobian matrix of the above triangular element. (16)

Unit - IV

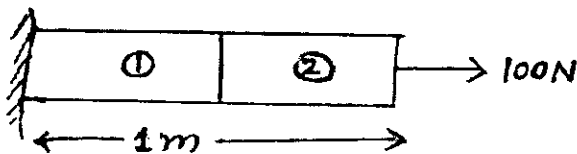
4. Using Galerkin's approach. Find element stiffness matrix and force vector for 1 D equilibrium equation.

$$\frac{d}{dx} \left(EA \frac{du}{dx} \right) + e Ag = 0$$

Use quadratic interpolation for displacement variable u . Explain the essential and natural boundary conditions involved in this problem. (16)

OR

4. a) Solve the displacement for two element mesh using variational technique for following problem (8)



Cross - section area = 30 mm^2

$$E = 2 \times 10^8 \text{ N/m}^2$$

- b) Derive 1 D heat transfer equation by using any variational method. (8)

Unit - V

5. Write

(8+8=16)

- i) p and h refinement methods.
- ii) Concept of element mass matrix in dynamics analysis.

OR

5. a) Discuss the difference between finite element methods, Finite difference methods and finite volume methods. (10)
- b) Discuss steps involved in finite element modeling. (6)

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B.Tech. VII Semester (Main/Back) Examination, Nov./Dec. - 2015**Mechanical Engg.****7ME2A 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. (Mentioned in form No.205)

1. Refrigerant tables and charts 2. Psychrometric chart and steam table

Unit - I

1. a) Explain the effect of followings on the performance of vapour compression refrigeration system with the help of T-S & P-h charts.
 - i) Decrease in evaporator pressure
 - ii) Increase in condenser pressure
 - iii) Suction vapour superheat
 - iv) Subcooling of saturated liquid (8)
- b) Explain the construction and working of flash chamber incorporated in vapour compression system, How removal of flash gas helps in improving the performance of compound vapour compression refrigeration System? (8)

OR

1. a) Calculate cooling capacity in Tons, Indicated power and C.O.P of a simple NH_3 vapour compression system which has compressor with piston displacement of $2\text{m}^3/\text{min}$, a condenser pressure of 12 bar and evaporator pressure of 2.5 bar. The liquid is subcooled to 20°C by soldering the liquid line to suction line. The temperature of vapour leaving the compressor is 100°C , heat rejected to compressor cooling water is 5000 kJ/hour and volumetric efficiency of compressor is 0.8. (10)

- b) Explain with the help of neat sketch, the working of a refrigeration system having three evaporators at different temperatures with individual compressors and multiple expansion valves. (6)

Unit-II

2. a) A dense air refrigeration cycle operates between pressures of 4 bar and 16 bar. The air temperature after heat rejection to surroundings is 37°C and air temperature at exit of refrigerator is 7°C . The isentropic efficiencies of turbine and compressor are 0.85 and 0.80 respectively. Determine compressor and turbine work per TR, C.O.P. and power per TR, Take $\gamma = 1.4$ and $C_p = 1.005 \text{ KJ/Kg K}$. (10)
- b) Explain the term "tonne of refrigeration". What is the difference between a refrigerator and a heat pump? Derive an expression for the performance factor for both if they are running on reversed carnot cycle. (6)

OR

2. a) The higher we go, the cooler we find, then why air crafts are air conditioned when they cruise at an altitude of 8000m? (6)
- b) An air craft moving with speed of 1000 km/h uses simple gas refrigeration cycle for air conditioning. The ambient pressure and temperature are 0.35 bar and -10°C respectively. The pressure ratio of compressor is 4.5. The Heat exchanger effectiveness is 0.95. The isentropic efficiencies of compressor and expander are 0.8 each. The cabin pressure and temperature are 1.06 bar and 25°C . Determine temperatures and pressures at all points of the cycle. Also find the volume flow rate through compressor inlet and expander outlet for 100 TR. Take $C_p = 1.005 \text{ KJ/Kg K}$, $R = 0.287 \text{ KJ/Kg K}$ and $C_p/C_v = 1.4$ for air. (10)

Unit - III

3. a) Describe the working of practical Aqua-Ammonia vapour absorption refrigeration system with neat sketch. (8)
- b) Explain with the help of neat sketch, the working of a steam jet refrigeration system (8)

OR

3. a) Explain the construction and working of thermostatic expansion valve. (8)
- b) Write the factors considered for the selection of refrigerant for a system. Give the chemical formula and names of the refrigerants R-22 and R-114. (8)

Unit-IV

4. a) Explain the following terms related to psychrometry:

- i) Specific humidity
- ii) Relative humidity
- iii) Degree of saturation
- iv) Dew point temperature,

Also explain the physical significance of each.

(8)

- b) Atmospheric air at 0.965 bar enters the adiabatic saturator. The wet bulb temperature is 20°C and dry bulb temperature is 31°C during adiabatic saturation process. Determine:

- i) Humidity ratio of the entering air.
- ii) Vapour pressure and relative humidity at 31°C and
- iii) Dew point temperature.

(8)

OR

4. a) Define the term "Human Comfort" and explain the factors which affect human comfort.

(8)

- b) Define the term "Effective temperature" and explain its importance in air conditioning system. Describe the factors which affect effective temperature.

(8)

Unit-V

5. A hall is to be maintained at 24°C DBT and 60% R.H. When the following data are given:

Outdoor conditions = 38°C DBT and 28°C WBT

Sensible heat load in the room = 1,60,000 kJ/hr.

Latent heat load in the room = 40,000 kJ/hr.

Total infiltrated air = $1200\text{ m}^3/\text{hr}$

Apparatus dew point temp = 10°C

The quantity of recirculated air from the hall = 60% of total. If the recirculated air is mixed with the conditioned air after the cooling coil, then find the following

- i) The condition of air leaving the conditioner coil and before mixing with recirculated air.
- ii) Condition of air before entering the hall.
- iii) The mass of air entering the cooler.

iv) The mass of total air passing through the hall.

v) By pass factor of the cooling coil. (16)

OR

5. a) Differentiate between Central, District and Unitary air conditioning systems. (6)

b) What do you understand by the term cooling load? What are the different factors considered in load estimation sheet for comfort application (10)

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B.Tech. VII Semester. (Main&back) Examination, Dec. - 2015

Mechanical Engg.

7ME3A Operations Research

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 24

Instructions to Candidates:

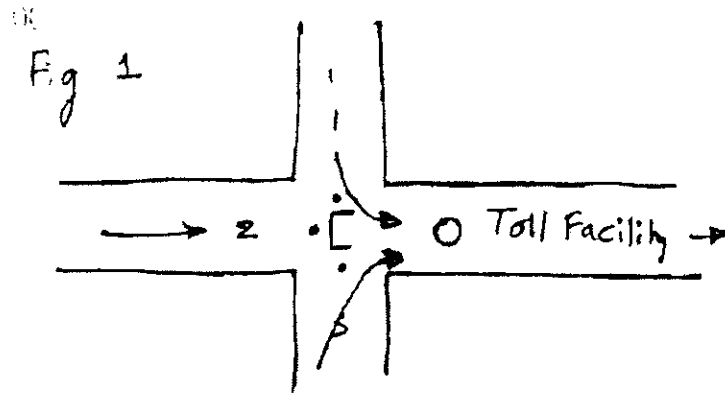
Attempt any Five questions. Selecting one question from each unit. All Questions carry equal Marks. (Schematic diagrams must be shown wherever necessary Any data you feel missing suitably be assumed and stated clearly units of quantities used/calculated must be stated clearly)

Unit - I

1. a) The toll rates are type A, Rs. 80/-; type B, Rs. 100/- and type C Rs. 250/-. The toll facility has a capacity of 1500 vehicles per hour. The traffic - light cycle should not exceed 3 minutes and each route should have a green signal for at least 30 seconds per cycle (Fig. 1.) Find a proposal for a timing for traffic signal that maximizes the revenue per cycle. Only one route can empty into the toll area at a time, and excess traffic is shunted to alternate routes. The following data is known. Formulate the LPP

Maximum Flow Rate

	Route 1	Route 2	Route 3
	720 Vehicles/hr	1440 Vehicles/hr	360 Vehicles/hr
Type A	50%	65%	40%
Type B	30%	25%	40%
Type C	20%	10%	20%



- b) Delhi Tourist Bureau is planning to run air conditioned buses to three hill stations Nainital, Kashmir and Simla. Tourist Bureau has buses in two sizes I and II. The capacity of buses, the number of trips each bus makes to a hill station if it is put on that route, the number of passengers for a hill station are shown in the following table

Bus type	Capacity	No.of Buses	No.of	Daily trips to		
				Nainital	Kashmir	Simla
I	80	5	2	1	3	
II	50	10	4	3	5	
No.of	Daily passengers		200	160	250	

After reaching a hill station the bus returns without taking passengers. The expenditure of one trip to different hill stations is shown below. The loss due to one vacant seat in a bus is also given

8)

Bus type

Expenditure (in Rs.) Per trip for

Nainital

Kashmir

Simla

I

1000

1000

1500

II

600

700

900

Loss Per Vacant

Seat is Rs.

30

20

40

Formulate the above problem as a LPP to determine the allocation of buses to hill stations so that the total cost of the system is minimized. (8)

OR

1. Consider the following LPP.

$$\text{Min } Z = 2x_1 + x_2$$

Subject to

$$3x_1 + x_2 = 3$$

$$4x_1 + 3x_2 \geq 6$$

$$x_1 + 2x_2 \leq 3$$

$$x_1, x_2 \geq 0$$

- a) Solve the above problem using Big - M method
- b) Now change availabilities $\vec{b}$ from $(3, 6, 3)^T$ to $(5, 5, 3)^T$. Find the solution again using sensitivity analysis (10+6)

Unit - II

2. Solve the following integer problem by branch and bound technique using graphical method show the mode - branch tree

$$\begin{aligned} \text{Max } Z &= 21x_1 + 11x_2 \\ \text{st } 7x_1 + 4x_2 &\leq 13 \\ x_1, x_2 &\geq 0 \text{ and integer} \end{aligned} \quad (16)$$

OR

2. Let the value of money be assumed to be 10% per year and suppose that machine A is replaced after every three years where as machine B is replaced every six years. The yearly costs of both the machines are given as under

Year	1	2	3	4	5	6
Machine A(Rs.)	1000	200	400	1000	200	400
Machine B(Rs.)	1700	100	200	300	400	500

Determine which machine should be purchased (16)

Unit - III

3. On average 96 Patients per 24 hour day require the service of an emergency clinic. Also, an average, a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic. Rs 100 per patient treated to obtain an average servicing time of 10 minutes and that each minute of decrease in this average time would cost Rs 10 per patient treated. How much would have to be budgeted by the clinic to decrease the average size of the queue from $1\frac{1}{3}$ Patients to $\frac{1}{2}$ patient? (16)

OR

3. A and B play a game in which each has three coin a 5p, a 10p and a 20p. Each Player selects a coin without the knowledge of the other's choice. If the sum of the coins is an odd amount, A wins B's coin; if the sum is even, B wins A's Coin. Find the best strategy for each player and the value of the game (16)

Unit - IV

4. A company is currently working with a process, which after paying for materials, labour, etc. brings a profit of Rs 12,000/-. The company has the following alternatives
- The company can conduct research R_1 which is expected to cost Rs 10,000 and having 90% Probability of success. if successful, the gross income will be Rs 26,000/-
 - The company can conduct research R_2 , expected to cost Rs. 6,000 and having a probability of 60% success. If successful, the gross income will be Rs 24,000/-
 - The company can pay Rs 5,000/- as royalty of a new process which will bring a gross income of Rs 20,000/-
 - The company may continue the current process.

Because of limited resources, only one of the two types of research can be carried out at a time. Draw the decision tree and find the optimal strategy for the company

(16)

OR

4. Find the optimal order quantity for a product for which the price breaks are as follows:

Quantity	Unit cost (Rs)
$0 < q < 500$	Rs 10/-
$500 \leq q < 750$	Rs 9.25/-
$750 \leq q$	Rs 8.75/-

The monthly demand for the product is 200 units, storage cost is 2% of the unit cost and cost of ordering is Rs 100/-

(16)

Unit - V

5. a) What is the need of simulation. Also discuss the advantages/disadvantages of simulation method
- b) What are Random numbers? Give methods to generate them (8+8)

OR

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 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 interarrival time of customers and the service time at the counter are established.

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

Inter- arrival time	Frequency	Service time	Frequency
(minutes)	(%)	(minutes)	(%)
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		

Choose the following RNs for

Arrival

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

Service

31, 46, 24, 54, 63, 82, 32, 14, 63, 18, 52, 82, 03, 62, 22, 61, 29, 50, 24, 69, 54, 66, 46, 37, 18, 68, 86, 37, 82, 48. (16)

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7E7014**7E7014****B.Tech. VII Semester (Main) Examination, Dec. - 2015****Mechanical Engineering****7ME4A Turbomachines****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) What is Similitude? What are different types of similarities between the model and its prototype? (6)
- b) A model of a kaplan turbine, one tenth of the actual size is tested under a head of 5m when actual head for proto turbine is 8.5m, The power to be developed by prototype is 9000kW. When running at 120 rpm at an overall efficiency of 85%, determine
 - i) Speed,
 - ii) Discharge, and
 - iii) Power of model. (10)

OR

1. a) Define turbo machinery? Classify turbo machinery. Derive the Euler's expression for turbo machinery? (8)
- b) The drag force exerted by a flowing fluid on a solid body depends 4pm the length of the body 'L', velocity of flow, V, density of fluid δ and viscosity μ . Find an expression for drag force using Buckingham's theorem. (8)

Unit - II

2. a) Explain the phenomena of surging, stalling and choking in centrifugal compressor stage? What is their effect on the performance? How to minimize or prevent them. (8)

- b) A centrifugal blower takes in air at 100 KPa and 309K. It develops a pressure head of 750 mm W.G. while consuming a power of 33 kW. If the blower efficiency (η_B) is 80% and mechanical efficiency is 86%, determine the mass rate and volume rate and exit properties of air. (8)

OR

2. a) What is free vortex blade? Derive the work done and reaction ratio for a free vortex blade. (8)
- b) Briefly explain with suitable diagram how does the blade shape affect the performance of the compressor. (8)

Unit - III

3. a) What do you understand by characteristic curves of a pump? What is the significance of the characteristic curve? (8)
- b) An impeller of a centrifugal pump having internal and external diameter are 150 mm & 300 mm respectively. The vane angles of the impeller at inlet and outlet are 20° & 30° respectively. The pump is running at 1300 rpm. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water. (8)

OR

3. a) The stroke and bore of a cylinder reciprocally engine running at 70 rpm are 500 mm and 250 mm respectively. The 20m long delivery pipe has a diameter of 80 mm. Determine the power saved by installing in an vessel in the delivery pipe, if pipe friction factor is 0.008. (8)
- b) Derive an expression to obtain the work done by axial flow pump on fluid. (8)

Unit - IV

4. a) Derive the expression for specific work output and the efficiency of a simple cycle with reheat. Also draw their trends as a function of pressure ratio. (8)
- b) A gas turbine cycle has a perfect heat exchanger air enters the compressor at a temp. and pressure of 300K and 1 bar and discharges at 475K and 5 bar. After passing through the heat exchanger the air temperature increases its 655K. The temp. of air entering and leaving the turbine are 870°C and 450°C . Assuming no pressure drop through the heat exchanger, compute:
- The output per kg of air
 - The efficiency of the cycles
 - The work required to drive the compressor. (8)

OR

- a) Define polytropic efficiency. Derive expressions for polytropic efficiency and bring out the relation between the polytropic efficiency and isentropic efficiency. (6)
- b) Write short notes on following. (10)
- Ram jet engine
 - Pulse jet engine
 - Turbo fan engine.

Unit - V

- a) Explain a single stage velocity triangle with a neat sketch and derive an expression for blade efficiency. (6)
- b) A multistage gas turbine is to be designed with impulse stages, and is to operate with an inlet pressure and temperature of 6 bar and 900K and an outlet pressure of 1 bar. The isentropic efficiency of the turbine is 85%. All the stages are to have a nozzle outlet angle of 75° and equal outlet and inlet blade angles. Mean blade speed of 250 m/s and equal inlet and outlet gas velocities.
- Estimate the max. number of stage required. Assume $C_p = 1.15 \text{ KJ/Kg-K}$, $\gamma = 1.333$ and optimum blade speed ratio. (10)

OR

- a) Explain the following: (8)
- Zero percent reaction stage.
 - Fifty percent reaction stage, and
 - Hundred percent reaction stage.
- b) What do you understand by blade and stage efficiency? Derive an expression for blade efficiency. (8)

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7E7015

B.Tech. VII Semester (Main) Examination, Dec. - 2015**Mechanical Engineering****7ME5A Operations Management****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) Describe the operations function and nature of operations manager's job.
- b) What is the difference between efficiency, effectiveness and productivity in context with business organization?
- c) What do you understand by the term "Competitiveness" of an organization? What are the various ways that Business organizations compete? (5+5+6)

OR

1. a) How does the number of periods in a moving average affect the responsiveness of forecast? (3)
- b) A company records indicates that monthly sales for a seven-month period are as follows:

Month	Sales (000, unit)
Feb	19
Mar	18
Apr	15
May	20
Jun	18
July	22
Aug	20

- i) Forecast the sales for September using the following:
- Linear trend equation.
 - A five-month moving average
 - Exponential smoothing technique using smoothing constant equal to 0.20 and assuming a March forecast of 19,000.
 - A weighted average method using weights of 0.60 for August, 0.30 for July, and 0.10 for June. (4+2+2+2)
- ii) Which method seems least appropriate? Why? (3)

Unit - II

2. a) Discuss the factors that cause organizations to redesign their products or services?
- b) Briefly describe the five process types, and indicate the kinds of situations in which each would be used.
- c) Discuss the importance of product and process matrix. (5+5+6)

OR

2. a) Contrast design capacity and effective capacity.
- b) What is meant by "capacity in chunks," and why is that a factor in capacity planning?
- c) Why is capacity planning one of the most critical decisions a manager has to make? (5+5+6)

Unit - III

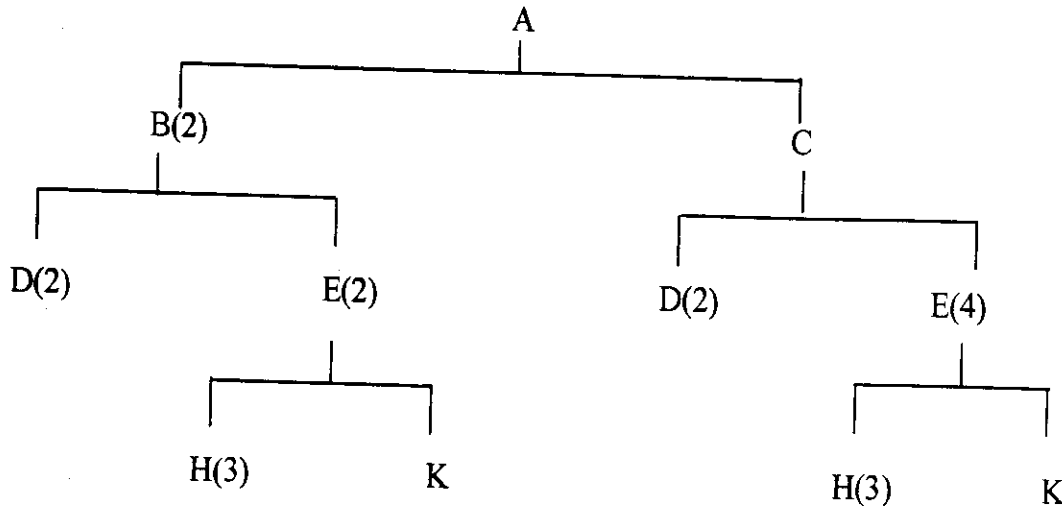
3. a) Discuss the various factors that influence location decisions with examples?
- b) A toy manufacturer produces toys in five locations throughout the country. Raw materials (Primarily barrels of powdered plastic) will be shipped from a new, centralized warehouse whose location is to be determined. The monthly quantities to be shipped to each location are the same. A coordinate system has been established, and the coordinates of each location have been determined as shown below. Determine the coordinates of the centralized warehouse.

Location	(X, Y)
A	3, 7
B	8, 2
C	4, 6
D	4, 1
E	6, 4

(8+8)

OR

3. a) Briefly discuss the advantages and disadvantages of each of the following aggregate planning strategies:
- Maintain a level rate of output and let inventories absorb fluctuations in demand.
 - Vary the size of the workforce to correspond to predicted changes in demand requirements.
 - Maintain a constant workforce size, but vary hours worked to correspond to predicted demand requirements.
- b) Develop a material requirements plan for component H. Lead times for the end item and each component except B are one week. The lead time for B is three weeks. Sixty units of A are needed at the start of week 8. There are currently 15 units of B on hand and 130 of E on hand, and 50 units of H are in production and will be completed by the start of week 2. (6+10)



Unit - IV

- What is the ultimate goal of a JIT system? What are the supporting goals? What are the building blocks?
- What are some of the main obstacles that must be overcome in converting from a traditional system to JIT? (8+8)

OR

A Group of six jobs is to be processed through a two-machine flow shop. The first operation involves cleaning and the second involves painting. Processing times are as follows:

PROCESSING TIME (HOURS)

Job	Work Center 1	Work Center 2
A	5	5
B	4	6
C	8	9
D	2	7
E	6	8
F	12	15

- i) Determine a sequence that will minimize the total completion time for this group of jobs.
- ii) Determine the throughput time and idle time at the work center. (16)

Unit - V

5. a) Why does supply chain management provide a competitive advantage to the firms using it?
- b) Explain the Bullwhip effect. What are its implications in supply chain management? (8+8)

OR

5. Draw the network for the data given in the table below and find the optimum duration and associated total project. Assume the indirect cost to be Rupees 185 per day.

Activity	Predecessors	Normal Time days	Normal Cost (Rs)	Crash Time (days)	Crash Cost (Rs)
A	-	3	300	1	400
B	-	4	600	2	750
C	A	6	800	3	1300
D	B	7	1300	4	1540
E	C,D	8	1600	6	1920
F	C,D	9	1700	6	2210
G	E,A	5	800	3	1080
H	F, B	6	900	4	1190

7E7017	Roll No. _____	Total No. of Pages : 2
	7E7017 B.Tech. VII Semester (Main&Back) Examination, Nov./Dec. - 2015 Mechanical Engg. 7ME6.2A 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) What do you meant by robot anatomy? What are the three degrees of freedom associated with the arm and body motion? (8)
- b) Explain following terms
 - i) Robot and robotics
 - ii) Accuracy
 - iii) Resolution
 - iv) Repeatability. (8)

OR

1. a) Justify application of robots in industries and enumerates its advantages. (8)
- b) Explain
 - i) Laws of robotics
 - ii) Design and control issues of robots. (8)

Unit - II

2. Define end effectors. Illustrate (with sketches) various types of end effectors.(16)

OR

2. a) Explain briefly the gripper design considerations? (8)
- b) Explain briefly various drive methods used for robot gripper systems. (8)

Unit - III

3. a) Explain Denavit - Hartenberg parameters with suitable examples and sketch. (10)
b) With an example differentiate forward and inverse kinematics. (6)

OR

3. a) Write the notation scheme for designating robot configuration with simple sketches. (12)
b) Explain redundancy. (4)

Unit - IV

4. Write a critical note on "typical machine vision system". (16)

OR

4. With suitable sketch explain various types of sensors used in robotics. (16)

Unit - V

5. a) State various robot languages. Discuss them in brief. (6)
b) Compare between computer control and robot software control? (5)
c) With suitable examples illustrate any four applications of robots. (5)

OR

5. a) With suitable application example, write a critical note on the lead-through and teach-pendant programming methods. (8)
b) Using a simple program for a pick-and-place application, enumerate the features and default structure of VAL robot programming language. (8)

Roll No. _____

[Total No. of Pages : 2]

7E4060**7E4060****B.Tech. VII Semester (Back) Examination, Dec. - 2015****Mechanical Engg.****7ME1 (O) Computer Aided Design****Common with PI****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) What is Computer Graphics. Explain the role of Computer for design purpose. (8)
- b) Convert a circle whose centre is (10,20) and the radius is 10 units using midpoint circle algorithm. (8)

OR

1. a) Explain DDA algorithm for line generation in Computer Aided Design. (8)
- b) Consider a line for (20,18) to (30,18). Use Bresenham's algorithm to rasterize the line with table. (8)

Unit - II

2. a) Explain the parametric representation of line and circle. (8)
- b) Generate a 3D Beizer curve using the following control point (5,4,2), (6,2,3), (5,-2,4) and (6,-4,3). (8)

OR

2. a) What do you mean by Beizer curve and explain the properties of Beizer curve that are useful in design. (8)
- b) Four vertices of Beizer polygon are $P_0(1,1)$, $P_1(2,3)$, $P_2(4,3)$, and $P_3(3,1)$. Determine seven points on the Beizer curve. (8)

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Unit - III

3. a) Write a short note on
- i) Boundary Representation
 - ii) Constructive solid geometry (2×4=8)
- b) What do you mean by hermit cubic curve and also derive the parametric representation for the hermit curve. (8)

OR

3. a) What do you mean by solid model? Discuss various entities of solid modelling? (8)
- b) Write down the comparison between wire frame modeling and surface modelling. (8)

Unit - IV

4. a) Explain the following terms used in transformation of geometric models with their matrix representation. (4×2=8)
- i) Translation
 - ii) Scaling
 - iii) Rotation
 - iv) Reflection
- b) Find the final position of the line end points (3,5) and (10,5) when it is translated by three units and then it is rotated by 30° in clockwise direction. (8)

OR

4. Find the reflection matrix when axis of reflection is $y=3x+2$. (16)

Unit - V

5. a) Explain the techniques and algorithm for hidden line and surface removal. (8)
- b) Explain point clipping, line clipping, and curve clipping used in viewing transformation. (8)

OR

5. a) Explain Cohen-Sutherland line clipping algorithm. (8)
- b) Explain the Z Buffer algorithm. (8)

Roll No. _____

[Total No. of Pages : 4]

7E4063**7E4063****B.Tech. VII Semester (Back) Examination, Dec. - 2015****Mechanical Engg.****7ME4 (O) 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.)

Unit - I

1. a) Explain Principle of operation and Working of steam Turbine. (6)
- b) What is the difference between Impulse and reaction turbine? Show the Pressure and velocity distribution. (6)
- c) Give classification of steam Turbine. (4)

OR

1. a) What is the purpose of compounding of Impulse Turbine? Mention the various type of compounding. Explain Simple velocity compounded Impulse Turbine with diagram. (8)
- b) Steam issues from the nozzle of delaval turbine with a velocity of 1200 m/s. The nozzle angle is 20° , The mean blade velocity is 400 m/s. And the Inlet and outlet angle of blade are equal. The mass of steam flowing through Turbine per hour is 900 kg. Calculate —
 - i) The blade angles
 - ii) The relative velocity of steam entering the blades.
 - iii) The tangential force on the blades.
 - iv) Power developed.
 - v) The blade efficiency. Assume $K = 0.8$. (8)

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Unit - II

2. a) Explain Velocity diagram for Impulse Turbine. What is the effect of Blade friction on velocity diagram. Deduce expression for force on blade and power developed by blade. (8)
- b) Deduce a general expression for blade efficiency of a stage of an Impulse turbine with single row wheel, assuming Equiangular blades, a nozzle angle α_1 and that K is the ratio of relative velocity at outlet from the moving blade to the relative velocity at Inlet. What is the condition of maximum efficiency. What is max. Efficiency if $\alpha_1 = 20^\circ$ and $K = 0.83$. If blade efficiency is 90% of Max. Value, What are the possible ratio of blade speed to steam speed. Draw velocity diagram for each case and state the blade angles. (8)

OR

2. a) List the various losses in steam turbine. Explain briefly. (8)
- i) Moving blade losses
 - ii) Blade friction losses.
 - iii) Losses in nozzle
 - iv) Disc friction losses.
- b) What do you mean by governing of steam turbine. What are the Chief methods of governing. Explain nozzle control governing with diagram. (8)

Unit - III

3. a) What are the basic principle of Regenerative feed heating. Explain most ideal regenerative feed heating cycle with T-s and h-s diagram. (8)
- b) A steam turbine operates under the following conditions
Initial pr = 21 bar, Initial super heat = 110°C , final pressure = 0.035 bar steam is bled off from the turbine stage at a pressure of 4.9, 1.4 and 0.28 bar for heating the main condensate. The expansion in the turbine is adiabatic and frictionless. It is assumed that the condensate is heated in each heater upto saturation temperature of steam in that heater and also drain water from heater is cascade through a trap next to the heater on Low pr. Side on it. The combined drain from heater operating at 0.28 bar are cooled in drain cooler to condensate temp. By sketching the system and show the process on T-s diagram. Calculate. (8)
- i) Mass of steam from each heater per kg of steam entering the turbine.
 - ii) Thermal efficiency of cycle.
 - iii) Thermal efficiency of corresponding Rankine cycle.

OR

3. a) Explain commonly used feed heaters with schematic diagram. (8)
- b) A steam power plant equipped with regenerative as well as reheat arrangement is supplied with steam to the H.P Turbine at 80 bar and 470°C . For feed heating a part of steam is extracted at 7 bar and the remainder of steam is reheated to 350°C in a reheater and then expanded in L.P Turbine drawn to 0.035 bar. Determine the following.
- Amount of steam bled off for feed heating.
 - Amount of steam in L.P Turbine.
 - Heat Supplied in boiler and reheater.
 - Output of the turbine
 - Cycle efficiency.

(8)

Unit - IV

4. a) Explain back pr. Turbine with diagram. In a factory where L.P steam is required for heating purpose and Electrical energy is required for power purposes. It is proposed to install a back pressure turbine to operate under following conditions :
- Initial steam pr and temp. 17.6 bar and 316°C , Exhaust pr. = 1.4 bar efficiency ratio of turbine = 0.7. What is the total power available in kW. If the generator efficiency is 94% and the amount of heat required per hour equals 52.7 million kJ. It may be assumed that the condensate drain from heater return to the boiler at the condensing temperature. (10)
 - Explain briefly pass out turbine with h-s diagram. (6)

OR

4. a) When the mix-pressure turbine is needed. Explain briefly mixed pressure Turbine with diagram. Explain various condition of operation. (10)
- b) 6800 Kg/h of live steam is supplied to a mixed pr. Turbine, the pressure and temp of steam after governor valve being 14.12 bar and 260°C . The turbine is also supplied with 950 Kg/hr. of dry and saturated steam at 1.4 bar. The exhaust pr. is 0.035 bar, If the Internal efficiency ratio of H.P and L.P stages are 0.76 and 0.7. And the mechanical losses are 25kW, Calculate output of Turbine coupling. (6)

Unit - V

5. a) What is the function of cooling Tower, classify cooling Tower. Explain Natural draught cooling tower with diagram. (8)

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- b) What are the function of ash handling system. Give types of ash handling system. briefly explain one of them. (8)

OR

5. Write short note on following.

- a) Air pre heater
- b) Steam power plant selection of location.
- c) Fuel and fuel handling system.
- d) Mechanical draught cooling Tower.

(4×4=16)

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Total No. of Questions:

Total No. of Pages:

Roll No. _____

B.Tech. VII Sem. (Back) Exam Dec.2015

Mechanical Engg.

7ME5 Production Development and Launching

7E4064

Time: 3Hours

Maximum Marks: 80

Min Passing Marks : 24

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. _____

2. _____

UNIT -I

- Q. 1 a) Describe the process of new product development?
b) Write brief notes(nay two) on following-:
i) Market Pull product
ii) Technology push products
iii) Platform based products

8+8= 16

OR

- Q.1 a) How new product effects the growth of an enterprise?
b) Explain the aspects of products development Team?

8+8=16

UNIT -II

- Q. 2 a) Explain the barriers to development of a new product?
b) "New product development is a collective effort" justify the statement?

8+8=16

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OR

- Q.2 a) How need-analysis is performed for a new product?
b) Explain economic existence of need.

10+6=16

UNIT -III

- Q. 3 a) Explain the concept feasibility and concept selection with procedure?
b) Explain creative twinkling process?

10+6=16

OR

- Q.3 Write brief note on the following:-
a) Psycholological set
b) Brain Storming
c) Inversion

6+5+5=16

UNIT -IV

- Q. 4 a) How preparation of assembly drawing is done?
b) Explain the role of ergonomics in product design.

10+6=16

OR

- Q.4 a) Discuss the various steps of detailed designed?
b) Explain compatibility?

12+4=16

UNIT -V

- Q. 5 Explain various stages of product launch cycle?

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OR

- Q.5 a) Explain critical path analysis involved in various product launch activities?
b) Explain new product launch strategy

8+8=16

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	7E4066	
	B.Tech. VII Semester (Back) Examination, Dec. - 2015	
	Mechanical Engg.	
	7ME6.2(O) Mechatronics	
	Common with PI	

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. Define Mechatronics. Neatly draw the mechatronics Circle. Discuss any four each applications of measurement based mechatronic Systems in manufacturing? Medical Field. (2+6+8)

OR

1. Represent mechatronics as the branch of multiple disciplines with the help of a sketch only. How will the conventional Design Process gets modified when the product moves from pure mechanical system to mechatronics system. Discuss with flow diagrams. (6+10)

Unit - II

2.
 - a) Define gauge factor with respect to strain gauges used in load cells.
 - b) What will be the change in resistance of an strain gauge having the gauge factor of 5.0 and resistance 60Ω if it is subject to a strain of 0.002?
 - c) A platinum resistance temperature sensor has a resistance of 100Ω at 0°C and forms one arm of a Wheatstone bridge. At this temperature the bridge is balanced with each of the other arms being 100Ω . The temperature coefficient of resistance of the platinum is $0.0039/\text{K}$. What will be the output voltage from the bridge for a change in temperature of 20°C ? The loading across the output is effectively open circuit and the supply voltage to the bridge is from a source of 3.0 V with negligible internal resistance. (4+4+8)

OR

2.
 - a) With an example, discuss the criteria for selecting a sensor for a mechatronics system.

- b) Sketch the interface of a difference amplifier with a thermocouple, where the difference in voltage between the e.m.f.s of the two junctions of the thermocouple is being amplified.
- c) Find out the value of Resistance R_2 of the amplification circuit, If one of the resistance i.e. R_1 is $10\text{ K}\Omega$ for a 10°C temperature difference at a thermocouple terminal producing an e.m.f. difference of $530\text{ }\mu\text{V}$. The amplified output of the circuit is 10 mV . (4+4+8)

Unit - III

3. a) List out the specifications of a stepper motor.
- b) Neatly show the general characteristics of a stepper motor.
- c) Design a pneumatic valve circuit for a Painting Robot Arm at an Automobile Service station, to give the sequence A+, followed by B+ and then simultaneously followed by A- and B-. You may use either sequential or cascading technique for the operations. (2+6+8)

OR

3. What is an Actuator? Compare electrical, hydraulic and pneumatic drives and actuators, based on their principles, design and factors which control the selection of actuators. (1+15)

Unit - IV

4. a) Design a Mechanical System which can be used to:
- Operate a sequence of micro-switches in a timed sequence and
 - Transform a rotation into a linear back and forth movement with simple harmonic motion.
- b) A proportional controller is used to control the height of water in a newly built tank at RTU hostel, where the water level can vary from 0 to 5.0m. The required height of water is 4.5m and the controller is to close a valve fully when the water rises to 4.9m and open it fully when the water falls to 4.1 m. What transfer function will be required? (6+10)

OR

4. a) Classify and discuss the options available for controlling a mechatronics systems based on the suitability, cost or any other parameter and write two examples of commercially available solution for each case.
- b) How will you use the closed loop control system for controlling the speed of a spindle in a CNC Vertical Milling Machine, explain only with
- Descriptive diagram of the system and
 - Block diagram of the system. (4+12)

Unit - V

5. "A smart id card operated car/bike parking barrier system at proposed RTU mechanical Engineering Block parking involves a PLC for opening when card is swapped at entry side and the vehicle is detected at the parking side". Design the system by
- a) Suitably selecting the elements for sensing, actuation and control (also sketch your design)
 - b) Design the PLC connections
 - c) Ladder program the PLC. (4+4+8)

OR

5. "The automatic control system for the temperature of the bath of the liquid consists of a reference voltage fed into a differential amplifier. This is connected to a relay which then switch on or off the electrical power to a heater in the liquid. Negative feedback is provided by a measurement system which feeds a voltage into a differential amplifier."
- a) Sketch a block diagram of the system
 - b) Explain how the error signal is produced?
 - c) Mathematically model the system for simulating its transient output. (4+4+8)
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