

7E7011	Roll No. _____	Total No of Pages: 3
7E7011 B. Tech. VII Sem. (Main/Back) Exam., Nov. – Dec. - 2017 Mechanical Engineering 7ME1A Finite Element Methods ME, PI		

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 26

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. NIL2. NIL**UNIT-I**

Q.1 (a) A beam of length L is simply supported at its ends and subjected to a uniformly distributed load of intensity ' g '. Compute the maximum displacement and bending stress. EI is constant. [8]

(b) Solve the matrix by Gauss elimination method – [8]

$$x_1 + 2x_2 + 3x_3 = 1$$

$$2x_1 + 3x_2 + 2x_3 = 2$$

$$3x_1 + 3x_2 + 4x_3 = 1$$

OR

Q.1 (a) Consider a weight W 600N, attached to a spring whose spring constant K (stiffness) is 200 N/cm. Find the displaced position of the weight at equilibrium position. [8]

(b) Write short notes on:

(i) Symmetry [4]

(ii) Semi bandwidth [4]

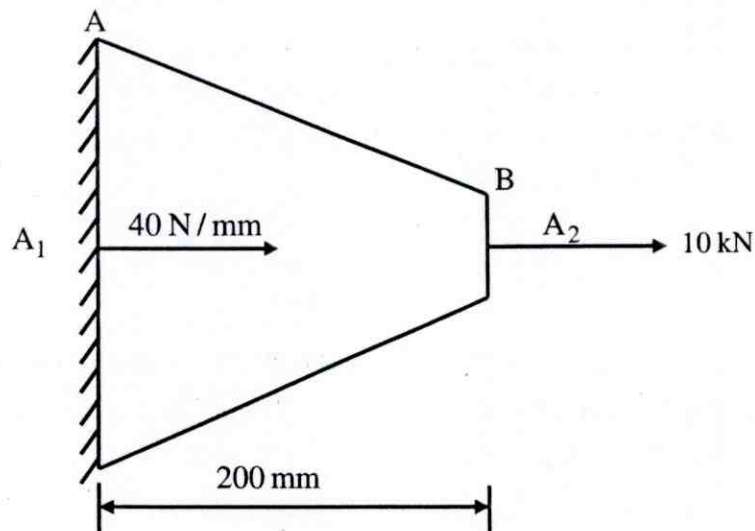
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UNIT-II

- Q.2 (a) Explain the basic steps for solving problem in finite one dimensional element. [8]
(b) Derive strain displacement matrix for a beam element using shape function. [8]

OR

- Q.2 A tapered bar as shown in figure made of isotropic material such as steel has young's modulus $E = 200 \text{ GPa}$. Area at A point is $A_1 = 20 \text{ mm}^2$ and area at B point is $A_2 = 100 \text{ mm}^2$. Discretize the bar into 3 element of 2 noded (linear bar element) and find out nodal displacement, displacement field stresses in each element. [16]



UNIT-III

- Q.3 (a) Explain two dimensional finite element analysis formulations using three noded triangular (CST). [10]
(b) Explain Isoparametric formulation of 1 – D bar elements. [6]

OR

- Q.3 (a) Define FEM formulation for plane stress and plane strain problems. [8]
(b) Explain numerical integration using gauss quadrature formula. [8]

UNIT-IV

- Q.4 (a) Explain Galerkin's method with suitable example. [8]
 (b) Explain Rayleigh Ritz method with mathematical statement. [8]

OR

- Q.4 (a) Solve the following differential equation by Ritz method: [10]

$$-\frac{d^2\mu}{dx^2} - c\mu + x^2 = 0 \quad \text{for} \quad 0 \leq x \leq 1 \quad \text{for boundary conditions}$$

$$\frac{d\mu}{dx}(x=0)=1, \quad \frac{d\mu}{dx}(x=1)=\frac{\mu}{3}$$

- (b) Explain weighted residual method with mathematical statement. [6]

UNIT-V

- Q.5 (a) Give application and advantages of FEM. [8]
 (b) Give the introduction to concept of element mass matrix in dynamic analysis. [8]

OR

- Q.5 Define the following terms:

- (a) Compatibility [4]
 (b) Continuity [4]
 (c) Polynomial Interpolation [4]
 (d) Static Condensation [4]

7E7012

Roll No. _____

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B. Tech. VII Sem. (Main/Back) Exam., Nov. – Dec. - 2017
Mechanical Engineering
7ME2A Refrigeration and Air-Conditioning

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 26

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.*

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 (Mentioned in form No. 205)*

1. Psychometric Chart2. Property Tables**UNIT-I**

Q.1 (a) What amount of heat is needed to melt 1 ton of ice in 24 hours? [4]

(b) A refrigeration machine is required to produce ice, at 0°C from water at 20°C.

The machine has a condenser temperature of 298 K while the evaporator temperature is 268 K. The relative efficiency of the machine is 50% and 6 kg of Freon – 12 refrigerant is circulated through the system per minute. The refrigerant enters the compressor with a dryness fraction of 0.6. Specific heat of water is 4.187kJ/kg K and the latent heat of ice is 335kJ/kg. Calculate the amount of ice produced in 24 hours. The table of properties of Freon – 12 is given below:

[12]

Temperature K	Liquid heat kJ/kg	Latent heat kJ/g	Entropy of liquid kJ/kg
298	59.7	138.0	0.2232
268	31.4	154.0	0.1251

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OR

- Q.1 (a) What are the merits and demerits of vapour compression system over Air refrigeration system? Explain. [8]
- (b) What is the difference between actual and ideal vapour compression cycle? [8]

UNIT-II

- Q.2 (a) State merits and demerits of an air refrigeration system. [6]
- (b) A refrigerating system operates on the reversed Carnot cycle. The higher temperature of the refrigerant in the system is 35°C and the lower temperature is -15°C . The capacity is to be 12 tones. Neglect all losses. Determine: [10]
- (i) Co-efficient of performance.
- (ii) Heat rejected from the system per hour.
- (iii) Power required.

OR

- Q.2 (a) Explain briefly an air refrigerator working on a reversed Carnot cycle. Derive expression for its C.O.P. [8]
- (b) An air refrigeration open system operating between 1 MPa and 100 kPa is required to produce a cooling effect of 2000 kJ/ min. Temperature of the air leaving the cold chamber is -5°C and at leaving the cooler is 30°C . Neglect losses and clearance in the compressor and expander. Determine: [8]
- (i) Mass of air circulated per min.
- (ii) Compressor work, expander work, cycle work
- (iii) COP and power in kW required

UNIT-III

- Q.3 (a) What do you understand by thermo – electric cooling? Explain it with a suitable diagram. [8]
- (b) Explain desirable properties of a good refrigerant for commercial use. [8]

OR

- Q.3 (a) Explain the working principle of vapour absorption refrigeration cycle with a suitable diagram. [10]
 (b) How are refrigerants classified? [6]

UNIT-IV

- Q.4 (a) Explain comfort chart with a suitable diagram. [8]
 (b) Explain various factors affecting human comfort. [8]

OR

- Q.4 (a) Explain the mechanism of heat loss by human body and their role in designing any air conditioning system. [8]
 (b) A car contains air at 25°C and 100kPa at a relative humidity of 75 percent. Determine.
 (i) The partial pressure of dry air [2]
 (ii) The specific humidity [3]
 (iii) The enthalpy per unit mass of the dry air. [3]

UNIT-V

- Q.5 It is required to design an air – conditioning system for an industrial process for the following hot and wet summer conditions: [16]

Outdoor conditions 32°C DBT and 65% R.H.

Required air inlet conditions 25°C DBT and 60% R.H.

Amount of free air circulated 250 m³/min

Coil dew temperature 13°C.

The required condition is achieved by first cooling and dehumidifying and then by heating.

Calculate the following:

- (i) The cooling capacity of the cooling coil and its by – pass factor.
 (ii) Heating capacity of the heating coil in kW and surface temperature of the heating coil if the by – pass factor is 0.3.
 (iii) The mass of water vapour removed per hour.

OR

Q.5 (a) Write a short note on 'by - pass factor'. [6]

(b) An air - conditioning system is to take in outdoor air at 10°C and 30 percent relative humidity at a steady rate of $45\text{m}^3/\text{min}$ and to condition it to 25°C and 60 percent relative humidity. The outdoor air is first heated to 22°C in the heating section and then humidified by the injection of hot steam in the humidifying section. Assuming the entire process takes place at a pressure of 100 kPa, determine [10]

- (i) The rate of heat supply in the heating section and
 - (ii) The mass flow rate of the steam required in the humidifying section.
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7E7013

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7E7013

B. Tech. VII Sem. (Main/Back) Exam., Nov. – Dec. - 2017
Mechanical Engineering
7ME3A Operations Research

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 26

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.

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(Mentioned in form No. 205)*

1. NIL _____

2. NIL _____

UNIT-I

Q.1 Consider the problem

[16]

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

$$\text{Subject to } 5x_1 + 4x_2 \leq 40$$

$$x_1 + 2x_2 \leq 12$$

$$5x_1 + 19x_2 \leq 95$$

$$x_1 \geq 0, x_2 \geq 0$$

OR

Q.1 A product is produced by four factories A, B, C and D. The unit production costs in them are ₹ 2, ₹ 3, ₹ 1 & ₹ 5 respectively. Their production capacities are factory A – 50 units, B – 70 units, C – 30 units and D – 50 units. These factories supply the

product to four stores, demands of which are 25, 35, 105 and 20 units respectively.

Unit transport cost in rupees from each factory to each store is given in a table below:

		Stores			
		1	2	3	4
Factories	A	2	4	6	11
	B	10	8	7	5
	C	13	3	9	12
	D	4	6	8	3

Determine the extent of deliveries from each of the factories to each of the store so that the total production and transportation cost is minimum. [16]

UNIT-II

Q.2 Explain cutting plane method in integer programming. [16]

OR

Q.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 (₹)	1000	200	400	1000	200	400
Machine B (₹)	1700	100	200	300	400	500

Determine which machine should be purchased? [16]

UNIT-III

Q.3 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

- Q.3 What is game theory? Include in your answer various approaches in solving for strategies and game values. [16]

UNIT-IV

- Q.4 What is an inventory system? Explain clearly the different costs that are involved in inventory problems with suitable examples. [16]

OR

- Q.4 Write the various steps in decision theory approach. [16]

UNIT-V

- Q.5 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 each. 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 derivation of 15. How many copies should be store order? [16]

OR

- Q.5 (a) Find the value of π experimentally by simulation? [8]
(b) Explain simulation language 'ARENA.' [8]
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7E7014

Roll No. _____

Total No of Pages: 4**7E7014**

B. Tech. VII Sem. (Main/Back) Exam., Nov. – Dec. - 2017
Mechanical Engineering
7ME4A Turbo machines

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 26

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.*

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*Use of following supporting material is permitted during examination.
 (Mentioned in form No. 205)*

1. NIL _____2. NIL _____

UNIT-I

Q.1 (a) Newton's second law of motion results in steady state linear momentum equation. Why is the angular momentum the most descriptive parameter for turbo machines? [8]

(b) The drag force exerted by a flowing fluid on a solid body depends on 4 parameters the length of the body 'L', velocity of flow V, density of fluid δ & velocity μ . Find an expression for drag force using Buckingham's theorem. [8]

OR

Q.1 (a) Derive an expression for specific speed of a hydraulic turbine. Also give the dimensionless specific speed ranges for hydraulic turbine. [8]

(b) Write down the expression for the dimensionless power coefficient of a turbine stage. Prove that it is proportional to the loading coefficient. [8]

UNIT-II

- Q.2 (a) Explain the phenomenon of surging, rotating stall and choking for centrifugal compressor. [2×4=8]
- (b) What is slip factor? A centrifugal impeller has 17 radial blades in the impeller of 45cm. Dia. The tip diameter of eye is 25cm. Determine the slip factor by three different formula. [1+7=8]

OR

- Q.2 (a) Draw a sketch of an axial flow compressor with inlet guide vane & explain the working principle of the compressor. [8]
- (b) The data referring to a test on an axial flow compressor are given as:
 Atmospheric temperature and pressure at inlet are 18°C & 1 bar, total head temperature in delivery pipe is 165°C. Total head pressure in delivery pipe is 3 bar. Calculate - [3+3+2=8]
- (i) Total head isentropic efficiency
 - (ii) Polytropic efficiency
 - (iii) Air velocity in delivery pipe.

UNIT-III

- Q.3 (a) Explain for a centrifugal pump why there should be a minimum speed for discharge to start. [8]

- (b) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1200 rpm, works against a total head of 75m. The velocity of flow through the impeller is constant & equal to 3m/s. The vanes are set back at angle of 30° at outlet. If the outlet diameter of the impeller is 60 cm & width at outlet is 5cm, determine -

[8]

- (i) Vane angle at inlet
- (ii) Work done per sec by impeller
- (ii) Manometric efficiency

OR

- Q.3 (a) Define slip, percentage slip & negative slip of reciprocating pump. Explain the function of air vessels in a reciprocating pump.

[4+4=8]

- (b) Discuss the typical characteristics of an axial flow pump. Also explain regulation by adjustable impeller blades of an axial flow pump.

[4+4=8]

UNIT-IV

- Q.4 (a) Air at 1 bar & 15°C enters into compressor and comes out at 12 bar. Re-heater is placed optimally. The maximum cycle temperature is 1200°C . Take compressor and turbine efficiency as 0.8 and 0.9, ($\gamma = 1.4$, $C_p = 1.005 \text{ kJ/kg. K}$). Determine efficiency and work ratio.

[8]

- (b) Compare Reheat cycle with inter cooler and heat exchanger in detail, with sketches.

[8]

[7E7014]

OR

Q.4 (a) Derive the following relation for the intake of a turbojet engine.

$$P_1/P_a = \left[1 + \left(\frac{\eta_i Ca^2}{2C_p T_a} \right) \right]^{\gamma/\gamma-1}$$

Where P_a , T_a are ambient pressure & temperature and Ca is forward speed of aircraft. [8]

(b) Derive expression for specific thrust and efficiency of Ramjet engine. [8]

UNIT-V

Q.5 (a) Differentiate between Impulse type & Reaction type gas turbine with help of velocity triangles. Derive an expression for degree of reaction in reaction type gas turbine. [8]

(b) For an axial flow gas turbine, shaft work is 46.5 kJ/kg, blade velocity is 183 m/s, axial velocity of air is 91.5 m/s, degree of reaction is 30%. Find inlet & outlet blade angles. [8]

OR

Q.5 (a) What do you understand by blade and stage efficiency? Derive an expression for blade efficiency. [8]

(b) 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]

7E7015	Roll No. _____	Total No of Pages: 4
<p style="font-weight: bold; font-size: 1.2em;">7E7015</p> <p style="font-weight: bold;">B. Tech. VII Sem. (Main/Back) Exam., Nov. – Dec. - 2017</p> <p style="font-weight: bold;">Mechanical Engineering</p> <p style="font-weight: bold;">7ME5A Operations Management</p>		

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 26

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.*

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(Mentioned in form No. 205)*

1. NIL

2. NIL

UNIT-I

Q.1 (a) Briefly describe the term operations management. Briefly discuss each of these terms related to the historical evolution of operations management: - [2+6=8]

- (i) Industrial Revolution
- (ii) Scientific Management
- (iii) Interchangeable parts
- (iv) Division of labour

(b) Explain scope of operations management & framework of managing operations. [4+4=8]

OR

Q.1 (a) Why is there a need of demand forecasting? Explain quantitative methods of forecasting. [2+6=8]

- (b) An organisation records indicate that monthly sales for a 8 – month period are as follows:- [2+2+2+2=8]

Month	Jan	Feb	Mar	Apr	May	June	Jul	Aug
Sales ($\times 10^4$, unit)	20	19	18	15	20	18	22	20

- (i) Forecast the sales for Sep using following -
- (1) Linear trend equation
 - (2) A Five month moving average method
 - (3) A weighted average method using weight of 0.65 for Aug. 0.30 for July, & 0.15 for June.
 - (4) Exponential smoothing techniques using smoothing const. equal to 0.20 & assume a forecast for March as 19×10^4

UNIT-II

- Q.2 (a) What do you understand by product & service? Explain process selection. Discuss different types of production systems with examples & layout. [2+2+4=8]
- (b) Explain product process matrix & discuss process planning. Discuss various steps involved in process planning. [2+2+4=8]

OR

- Q.2 (a) What do you understanding by capacity planning? Explain measurement of capacity planning & discuss determinants of effective capacity. [8]
- (b) Classify capacity planning? Explain the steps involved in capacity planning process. [8]

UNIT-III

- Q.3 (a) Describe the means of plant location & layout? Discuss the factors affecting plant location. [8]
- (b) Write short note on material handling. [2]

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- (c) Assembly of a simple component involved 7 work elements. The following table gives elements time & operations precedence. Element time is in min. Time for a shift is 7 hour/day & total output units required are 300 units /day. [6]

Work element	1	2	3	4	5	6	7
Element time (Min)	1.24	0.78	0.54	0.28	1.12	0.7	0.54
Immediately precedence by element	-	1	2	3	3	4,5	6

Draw network diagram & calculate -

- Cycle time
- Balancing Efficiency
- Theoretical min. No. of work stations

OR

- Q.3 (a) Define aggregate planning? What are variables used in aggregate planning? Explain aggregate planning strategies & guidelines. [2+2+4=8]
- (b) What is the MRP? What are the input & output required by the MRP processing logic? Discuss objectives of MRP. [2+4+2=8]

UNIT-IV

- Q.4 (a) What do you understand by production control? Discuss its functions. [2+6=8]
- (b) Following table gives manufacturing time (in Min) of 8 Jobs to be processed on three machines M1, M2, M3 in order M1, M2, M3. Sequence the job using Johnson's method & find overall processing time. Find also waiting times of jobs & idle times of the three machines. [8]

Job	A	B	C	D	E	F	G	H
M1	13	18	21	20	16	27	22	12
M2	10	9	14	15	12	13	11	8
M3	16	19	23	24	19	25	23	15

OR

- Q.4 (a) What do you understand by JIT? Discuss objectives & element of JIT approach. [2+4+2=8]
Explain supporting goals of JIT. [3+3+2=8]
- (b) Write short notes on:
- (i) Lean operation system
 - (ii) KANBAN System
 - (iii) Synchronous production

UNIT-V

- Q.5 (a) Describe supply chain management. Discuss need & elements of SCM. [2+3+3=8]
- (b) Describe in detail purchase management & discuss objectives of purchasing with diagram. [4+4=8]

OR

- Q.5 (a) Point out the difference between PERT & CPM. Explain how Float is calculated in PERT approach. What is crashing? [4+3+1=8]
- (b) Consider a project for which the time estimates are given in table below. Construct the PERT network. What is critical path? Find the probability of completing the project before 23 days. [8]

Activity	1-2	1-3	2-3	2-4	2-6	3-4	3-5	4-5	4-6	5-6
Estimated (days) time t_o	2	1	0	2	5	3	3	4	2	2
t_m	5	4	0	4	7	5	6	6	5	6
t_p	8	7	0	6	12	10	9	10	8	6

7E7018

Roll No. _____

Total No of Pages: 4

7E7018

B. Tech. VII Sem. (Main/Back) Exam., Nov. – Dec. - 2017
Mechanical Engineering
7ME6.3A CNC Machines and Programming
ME, PI

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 26

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.*

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1. NIL2. NIL**UNIT-I**

- Q.1 (a) Explain the function of MCU in NC machine. What is the roll of PLC in CNC system? [2+2=4]
- (b) What are the problems that are associated with conventional NC? How can it be overcome in CNC? [2+2=4]
- (c) List out the advantages and disadvantages of NC systems. Under what circumstances use of NC would be preferred? [3+3+2=8]

OR

- Q.1 (a) What is automation? Discuss the importance and need of automation in Indian industry. Why complete automation is not acceptable to Indian society? [2+4+2=8]

- (b) What are the various types of feedback and motion control system used in NC Machines? Discuss with the help of suitable diagrams. [8]

UNIT-II

- Q.2 (a) Enumerate the design criteria to be used in designing NC/CNC Machine tools. [6]
- (b) What is "drive system" and what types of drive mechanisms are used in CNC? [2+4=6]
- (c) Why is a re-circulating ball screw universally used in the actuating systems in CNC machine tools? [4]

OR

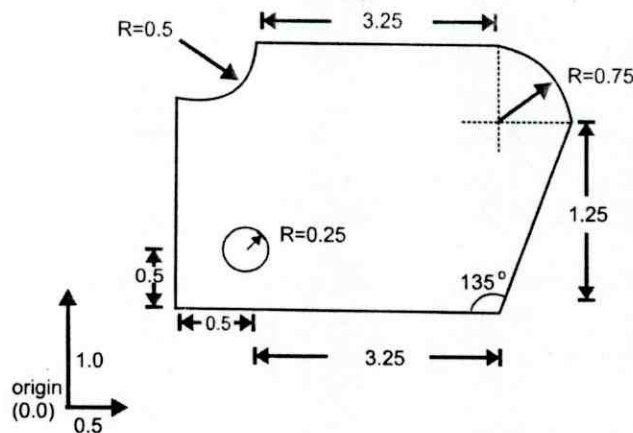
- Q.2 (a) What are the requirements of structure in the case of NC/CNC Machine? [6]
- (b) Define Sensors and their applications in Numerical Control Machines? Also write down various types of sensors. [2+4+4=10]

UNIT-III

- Q.3 (a) Explain the role of computer in computer assisted part programming. [4]
- (b) Differentiate clearly between fixed cycles/ canned cycles and subroutines/ subprogram. Explain how canned cycles can reduce the programming efforts. [2+4=6]
- (c) How is cutter compensation specified in a machining centre? With the help of example show how is it operational? Also mention the drawbacks of using this method. [2+2+2=6]

OR

Q.3 Write the APT geometry statements necessary to fully define the component illustrated in figure below. Attempt to keep the number of statements to a minimum. Also write motion statements. Generate any additional check lines if necessary. Start from the origin and proceed anticlockwise around the work piece. Also sketch the path of the tool. All dimensions are in inches. [16]



UNIT-IV

Q.4 What are the differences between retrieval and generative type of computer – aided process planning? Which is better? Explain your answer. Also mention salient features of variant type of CAPP system. [16]

OR

Q.4 (a) What are the various methods for robot programming? Explain the features of VAL and AML robot programming. [8]

(b) Describe NC simulation. What do you mean by Kinematic simulation and volumetric simulation? [8]

UNIT-V

Q.5 Write short notes on the following:

[4×4=16]

- (a) Off – line adaptive control
- (b) CAM
- (c) FMS
- (d) Rapid Product Development

OR

Q.5 (a) What are the various components of Computer Integrated Manufacturing Systems (CIMS)? Explain the key functions of CIMS. [4+4=8]

- (b) Under what conditions, an adaptive control is recommended in CNC machines? Discuss its types with help of suitable examples. [8]

7E4060

Roll No. _____

Total No of Pages: **3**

7E4060

B. Tech. VII Sem. (Back) Exam., Nov. – Dec. - 2017
Mechanical Engineering
7ME1 (O) Computer Aided Design
ME, PI

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 26

Instructions to Candidates:

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1. NIL

2. NIL

UNIT-I

- Q.1 (a) Define Computer Graphics and discuss application of computer graphics in major engineering field. [8]
(b) Draw a circle with center at the origin and radius of 10 units with the help of Bresenham's Algorithms. [8]

OR

- Q.1 (a) How many types of standard algorithms are available for line generation? Explain. [8]
(b) Write down the Bresenham's circle algorithm and explain in detail with neat and clean diagram. [8]

UNIT-II

- Q.2 (a) What are the merits and demerits of wire frame modeling? [8]
(b) Given vertices of Bezier polygon: $B_0 [1, 1]$, $B_1 [2, 3]$, $B_2 [4, 3]$, $B_3 [3, 1]$. Determine Seven points on the Bezier Curve. [8]

[7E4060]

OR

- Q.2 (a) Find the algebraic coefficient of a Parametric cubic curve whose coordinate at $u=0$ is $(-1, -2, -1)$ and at $u=1$ is $(4, 2, 4)$ and direction cosines are constant at all the points. Find the direction cosines also. [8]
- (b) Consider a planar quadratic curve given by $x = t_2 - 2t + 2$. Determine its implicit equation. [8]

UNIT-III

- Q.3 (a) What are the properties that a solid model or an abstract solid should capture mathematically to be defined as a valid solid model. [8]
- (b) Show that a bi-cubic surface patch degenerates to a cubic spline if the four corner points of the patch are collapsed to two. [8]

OR

- Q.3 (a) What do you mean by Solid model? Discuss various entities of solid modeling. [8]
- (b) Derive the parametric representation of Hermite Bicubic Curve. [8]

UNIT-IV

- Q.4 (a) (i) Parametric and non parametric representation of curves [3]
 (ii) What do you know about surface of revolution and ruled surfaces? [3]
- (b) Find the new coordinate of an unit cube with vertices $(0, 1, 0)$, $(1, 1, 0)$, $(1, 1, 1)$, $(0, 1, 1)$, $(0, 0, 0)$, $(0, 0, 1)$, $(1, 0, 1)$, $(1, 0, 1)$ rotated about an axis defined by its end points A $(2, 1, 0)$ and B $(3, 3, 1)$. The Angle of rotation should be 90° counter clockwise. [10]

OR

- Q.4 (a) What do you mean by projections? Differentiate between Parallel and Perspective Projections. [6]
- (b) Define Homogeneous coordinate system. [10]
 Rotate the rectangle formed by points $P_1(1, 1)$, $P_2(2, 1)$, $P_3(2, 3)$, $P_4(1, 3)$, by 30° counter clockwise about a point S $(3, 2)$.

UNIT-V

Q.5 Discuss in detail at least three algorithm for Line Clipping. Also give a comparison among them with suitable example. [16]

OR

Q.5 Write notes about the following:

- (a) Sample Hidden Line Algorithm [4]
 - (b) The Priority Algorithm [4]
 - (c) The Z Buffer Algorithm [4]
 - (d) Area Oriented Algorithm [4]
-

7E4063

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Total No of Pages: 3**7E4063**

B. Tech. VII Sem. (Back) Exam., Nov. – Dec. - 2017
Mechanical Engineering
7ME4 (O) Steam Turbine & Steam Power Plant

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 26

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. NIL2. NIL**UNIT-I**

- Q.1 (a) Explain classification of steam turbines. [6]
 (b) What is compounding? Explain pressure compounding of steam turbines. [10]

OR

- Q.1 In a stage of an impulse steam turbine the mean diameter of the blade ring is 800 mm and the speed of rotation is 3000 rpm. The direction of final absolute velocity of steam is axial. The inlet and exit angles of the blades are 30°. Assuming a blade friction factor of 0.85 and a steam flow rate of 1 kg/s, determine [16]

- (a) the nozzle angle,
- (b) the absolute velocity of steam leaving the nozzle,
- (c) the enthalpy drop in the stage,
- (d) the tangential thrust
- (e) the axial thrust
- (f) the blading work, and
- (g) the blading efficiency.

UNIT-II

Q.2 (a) Define: -

[3×2=6]

- (i) Diagram power,
 - (ii) Diagram efficiency.
- (b) The velocity of steam leaving the nozzle of an impulse turbine is 900 m/s and the nozzle angle is 20° . The blade velocity is 300 m/s and the blade friction factor is 0.7. Calculate following for a mass flow rate of kg/s and symmetric blading- [10]
- (i) the blade inlet angle.
 - (ii) the driving force on the wheel.
 - (iii) the axial thrust.
 - (iv) the diagram power.
 - (v) the diagram efficiency.

OR

Q.2 (a) Which energy losses take place in steam turbines?

[8]

(b) What do you understand by throttle governing and nozzle governing?

[8]

UNIT-III

- Q.3 (a) Steam is generated at 70 bar, 500°C and expands in a turbine to 30 bar with an isentropic efficiency of 77%. At this condition, it is mixed with steam twice its mass at 30 bar, 400°C . The mixture then expands with an isentropic efficiency of 80% to 0.06 bar. At a point in the expansion where the pressure is 5 bar, steam is bled for feedwater heating in a direct contact heater, which raises the feedwater to the saturation temperature of the bled steam. Calculate the mass of steam bled per kg of high pressure steam and the cycle efficiency. Assume that the L.P. expansion condition line is straight. [10]
- (b) Explain the working principle of a surface heater with a suitable diagram. [6]

OR

Q.3 (a) In a reheat cycle steam at 500°C expands in an h. p. turbine till it is saturated vapour. It is reheated at constant pressure to 400°C and then expands in an l. p. turbine to 40°C . If the maximum moisture content at the turbine exhaust is limited to 15%, find - [10]

- (i) the reheat pressure,
- (ii) the boiler pressure,
- (iii) the net specific work output,
- (iv) the cycle efficiency, and
- (v) the steam rate.

Assume all processes ideal.

(b) The use of regenerative feedwater heating increases the capital cost but reduces the operating cost of a steam power plant. Explain. [6]

UNIT-IV

- Q.4 (a) What is bypass governing? [8]
 (b) What is a back pressure turbine? What are its applications? [8]

OR

- Q.4 (a) What is the function of a governor? [6]
 (b) What is a pass-out turbine and when is it used? [10]

UNIT-V

- Q.5 (a) What are the advantages and disadvantages of pulverized coal firing? [8]
 (b) Explain the factors affecting the selection of location for a steam power plant. [8]

OR

- Q.5 (a) What is a cyclone furnace? Where is it used? Mention its advantages and disadvantages. [8]
 (b) What is a supercritical boiler? What are its merits and demerits? [8]

7E4064

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Total No of Pages: **3****7E4064**

B. Tech. VII Sem. (Back) Exam., Nov. – Dec. - 2017
Mechanical Engineering
7ME5 (O) Product Development and Launching

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 26

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. NIL2. NIL**UNIT-I**

Q.1 (a) Explain the new product development process. [8]

(b) Differentiate between market pull product and technology push product. [8]

OR

Q.1 (a) What do you mean by product life cycle? Also discuss the various phases of product life cycle. [8]

(b) Discuss the generic product development process for market pull product. [8]

UNIT-II

Q.2 (a) What do you mean by need identification? Explain how need analysis is performed. [8]

(b) Discuss the target marketing in brief. [8]

OR

Q.2 Write short notes on following: -

- (a) Economic existence of need [4]
- (b) Benchmarking [4]
- (c) Engineering statement [4]
- (d) Need Analysis [4]

UNIT-III

Q.3 (a) "Concept generation is a creative process". Justify the statement with a suitable example. [8]

(b) Write brief notes on the following:-

- (i) Analogy [4]
- (ii) Inversion [4]

OR

Q.3 What is creativity? Also explain the creative thinking process and major roadblocks of creativity. [16]

UNIT-IV

Q.4 (a) Differentiate between conceptual design and embodiment design. [8]

(b) What do you mean by product architecture? Also discuss the product architecture process. [8]

OR

- Q.4 (a) Explain the role of ergonomics in product design. What is aesthetic product? [8]
- (b) Write briefly on:-
- (i) Design for manufacturing [4]
 - (ii) Design compatibility [4]

UNIT-V

- Q.5 (a) What are the challenges faced in managing the development and launch of new product? Give examples [8]
- (b) Explain following: - [8]
- (i) Project scheduling
 - (ii) Project task matrix

OR

- Q.5 (a) What do you understand by product launch cycle? Also discuss various stages of product launch cycle. [8]
- (b) Differentiate between functional organization and project organization. [8]
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<p style="font-size: 18px; font-weight: bold;">7E4066</p> <p style="font-size: 16px; font-weight: bold;">B. Tech. VII Sem. (Back) Exam., Nov. – Dec. - 2017</p> <p style="font-size: 16px; font-weight: bold;">Mechanical Engineering</p> <p style="font-size: 16px; font-weight: bold;">7ME 6.2 (O) Mechatronics</p> <p style="font-size: 16px; font-weight: bold;">ME, PI</p>		

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 26

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. NIL _____

2. NIL _____

UNIT-I

- Q.1 (a) What do you mean by the term 'mechatronics'? Explain the mechatronic system with suitable diagram. [8]
- (b) What are N/C machines? Explain in detail their use in mechatronics field. [8]

OR

- Q.1 (a) Explain process control automation in mechatronics discipline with suitable example. [8]
- (b) Describe the scope and applications of mechatronics in different domains. [8]

UNIT-II

- Q.2 (a) What do you mean by sensor? What are the different factors considered while selecting sensor? Explain. [8]
- (b) Differentiate between sensor and transducer. Also explain characteristics of transducer. [8]

OR

- Q.2 With a neat diagram, explain flow sensors and their types. Mention merits and demerits. Explain working principle also. [16]

UNIT-III

- Q.3 (a) Explain the working principle of stepper motor with schematic diagram. Define step angle also. [8]
- (b) Write short note on:
- (i) Control valves [4]
- (ii) Solenoids [4]

OR

- Q.3 (a) Explain the working of pumps and compressors with diagram in detail. [8]
- (b) What do you mean by the term 'motor'? How it is useful in mechatronics field? Explain its classification in detail. [8]

UNIT-IV

- Q.4 (a) How analog to digital conversion is done? Explain the process in detail with diagram. [8]
- (b) What is control system? Explain and differentiate between open loop and closed loop system. [8]

OR

- Q.4 (a) Examine the stability of the system having characteristic equation- $S^5 + S^4 + 3S^3 + 3S^2 + 4S + 8 = 0$. Determine number of roots lying in right half of S^* Plane. [8]
- (b) How transfer function of a system is calculated? Derive transfer function of first order system. [8]

UNIT-V

- Q.5 (a) Explain the different phases of mechatronics design process in detail. [8]
- (b) Explain the main features and benefits of Grey Grain Separators in detail. [8]

OR

- Q.5 (a) Discuss the working and usefulness of CNC lathe machine in detail with suitable diagram. [8]
- (b) Explain in detail the design and working of Lift Control System. [8]