Hall Ticket Number :										

R-15

Code: 5G575

IV B.Tech. I Semester Regular & Supplementary Examinations November 2019

Advanced Manufacturing Systems

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) What are the components of manufacturing system? State its Limitations of traditional manufacturing systems. 7M

   b) Discuss various types of production systems. 7M

OR

2. State the principles and types of manufacturing systems for meeting the competitiveness in manufacturing 14M

UNIT–II

3. a) Explain the concept of Concurrent engineering 7M

   b) Discuss the features and requirements of Just-in-time production systems 7M

OR

4. a) Discuss quantitative analysis in cellular manufacturing – 7M

   b) Discuss rank order clustering technique. 7M

UNIT–III

5. a) Make comparison of mass production and lean production. 7M

   b) State basic elements of lean manufacturing and the principles of Lean Manufacturing 7M

OR

6. What is agile manufacturing discuss the aspects in reorganizing the production system for agility in areas of product design, marketing and production operations 14M

UNIT–IV

7. a) State the Elements of FMS 7M

   b) Discuss the Layout of FMS and state the Advantages and difficulties of FMS 7M

OR

8. a) Discuss the economic justification of FMS 7M

   b) Automated Guided Vehicles 7M

UNIT–V

9. a) Discuss the role of Expert systems in FMS 7M

   b) Discuss the role of AI in FMS 7M

OR

10. a) What is Machine Vision, how does it helps manufacturing 7M

    b) State the features of Factory of the future 7M

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Hall Ticket Number :										

R-15

Code: 5G573

IV B.Tech. I Semester Regular & Supplementary Examinations November 2019

Finite Element Methods

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

****

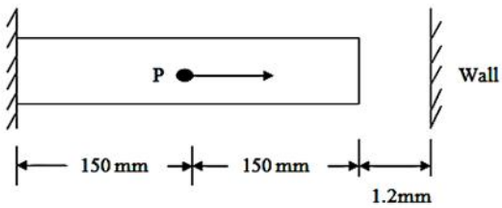
UNIT–I

1. a) Derive Stress-equilibrium conditions for structural element. 9M

   b) What is potential energy? State and explain the principle of minimum potential energy. 5M

OR

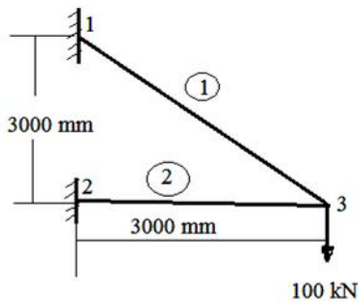
2 A rod subjected to an axial load P=600kN is applied as shown in figure. Divide the domain into two elements. Determine displacement at each node, stresses in each element and reactions at each node. Take A= 250 mm^2, E = $2X10^5$ N/mm^2.



14M

UNIT–II

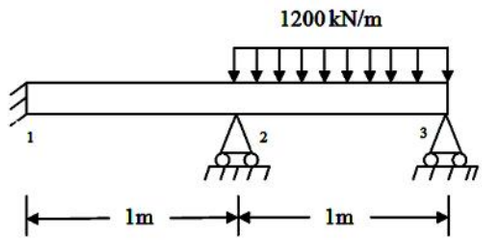
3. For the two-bar truss shown in figure, determine the displacements and stresses. A_1=500mm^2, A_2=1200mm^2, E=$2x10^5$ N/mm^2.



14M

OR

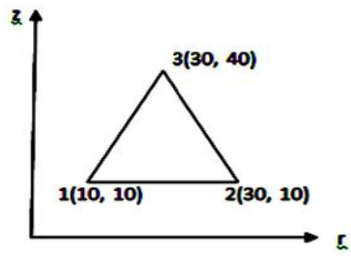
4. For the beam and loading shown in figure, determine the slopes at nodes 2, 3 and vertical deflection at the midpoint of the distributed load. E=200 GPa and I=$4X10^6$ mm^4.



14M

UNIT–III

5. Calculate the stiffness matrix for the triangular element shown in figure. Co-ordinates are given in mm. Assume plane stress conditions. Take E=$2.1X10^5$ N/mm^2, υ=0.25, t=10mm.

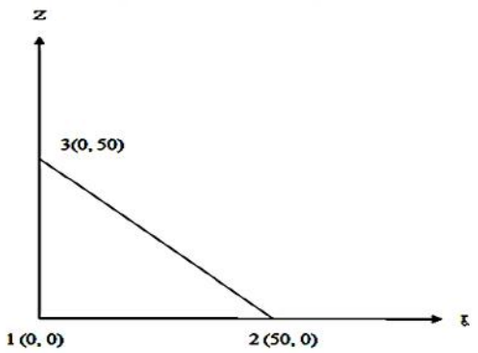


14M

OR

6. For the axisymmetric element shown in figure, determine the element stresses. Let E=210 GPa and ³ = 0.25. The coordinates are shown in millimeters. The nodal displacements are:

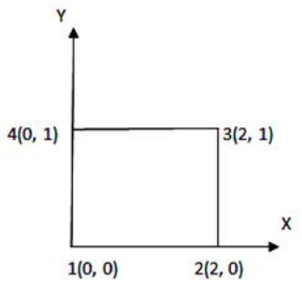
$$u_1 = 0.05mm, w_1 = 0.03mm \; u_2 = 0.02mm, \; w_2 = 0.02mm, u_3 = 0mm, w_3 = 0mm$$



14M

UNIT–IV

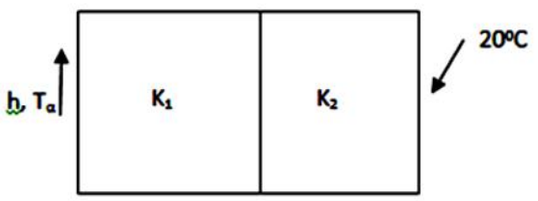
7 4 noded rectangular element is shown in figure. Determine (i) Jacobian Matrix (ii)Strain – Displacement Matrix (iii) Element Stresses. Take E=2x10^{5}N/mm^2, υ=0.25, U= [0, 0, 0.003, 0.004, 0.006, 0.004, 0, 0]^T mm. Assume Plane Stress conditions. (x, y) co-ordinates are in mm. Assume natural coordinates ¶ = 0, ¦ = 0.



14M

OR

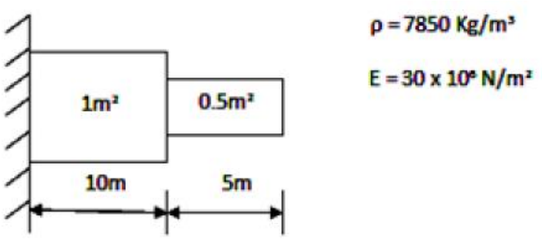
8. Determine the temperature distribution through the composite wall shown in figure when convective heat loss occurs on the left surface. Assume unit area. Thickness t_1 = 4 cm, t_2 = 2 cm, K_1 = 0.5W/cm K, K_2 = 0.05W/cm K, Tα=5^{0}C, h=0.1 W/cm^2 K. (use finite element method)



14M

UNIT–V

9. Determine the Eigen values and Eigen Vectors for the stepped bar as shown in figure?



14M

OR

10. Determine Eigen values and Eigen vectors of a stepped bar, for longitudinal vibrations using consistent mass matrix. Areas of 2 segments of bar are 50mm^2 and 100mm^2 and lengths are 500mm and 1000mm respectively. Assume E=200GPa and mass density is 8000 Kg/m^3. The bar is fixed at one end. 14M

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Hall Ticket Number :										

R-15

Code: 5G571

IV B.Tech. I Semester Regular & Supplementary Examinations November 2019

Operations Research

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. A company has contracted to produce two products, A and B, over the months of June, July, and August. The total production capacity (expressed in hours) varies monthly. The following table provides the basic data of the situation:

	June	July	August
Demand for A (units)	500	5000	750
Demand for B (units)	1000	1200	1200
Capacity (hours)	3000	3500	3000

The production rates in units per hour are .75 and 1 for products A and B, respectively. All demand must be met. However, demand for a later month may be filled from the production in an earlier one. For any carryover from one month to the next, holding costs of $.90 and $.75 per unit per month are charged for products A and B, respectively. The unit production costs for the two products are $30 and $28 for A and B, respectively. Develop an LP model to determine the optimum production schedule for the two products. (don't solve the model)

OR

2. Given a linear programming problem

$$\begin{aligned} Maximize \quad & Z = 8x_1 + 6x_2 + x_3 \\ subject\ to \quad & 8x_1 + 6x_2 + 2x_3 \leq 13 \\ & x_1 + x_2 + 2x_3 \leq 4 \\ & x_1, x_2, x_3 \geq 0 \end{aligned}$$

Obtain the value of the objective function at the optimum by simplex method.

UNIT–II

3. Use Vogels' Approximation method for finding the initial basic feasible solution and then determine the optimal transportation cost.

					Supply
	6	5	8	8	30
	5	11	9	7	40
	8	9	7	13	50
Demand	35	28	32	25	

OR

4. Imagine yourself to be the Executive Director of a 5-Star Hotel which has four banquet halls that can be used for all functions including weddings. The halls are all about the same size and the facilities in each hall differed. During a marriage season, 4 parties approached you to reserve a hall for the marriage to be celebrated on the same day. These marriage parties were told that the first choice among these 4 halls would cost '10,000 for the day. They were also required to indicate the second, third and fourth preferences and the price that they would be willing to pay. Marriage parties A and B indicated that they won't be interested in Halls 3 and 4. Other particulars are given in the following table.

Marriage Party	**Revenue/hall**			
	Hall			
	1	2	3	4
A	10,000	9,000	X	X
B	8,000	10,000	8,000	5,000
C	7,000	10,000	6,000	8,000
D	10,000	8,000	X	X

where X indicates that the party does not want that hall. Decide on an allocation that will maximize the revenue to your hotel.

UNIT–III

5. A computer has a large number of electronic tubes. They are subject to mortality as given below:

Week	1	2	3	4	5
Probability of Failure (hours)	0.10	0.26	0.35	0.22	0.07

The cost of replacing individual tubes which fail in service cost Rs. 60 per tube. However, if all the tubes (say, 1000) are replaced simultaneously, it costs Rs. 15 per tube. Determine the replacement policy that minimises the average cost.

OR

6. Solve the following (2×3) game graphically:

		B		
		I	II	III
A	I	1	3	11
	II	8	5	2

UNIT–IV

7. Arrivals at a telephone booth are considered to be Poisson, with an average time of 10 minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponentially with mean 3 minutes. Then,

(a) What is the probability that a person arriving at the booth will have to wait?
(b) What is the average length of the queue that forms from time to time?
(c) The telephone department will install a second booth when convinced that an arrival would expect to have to wait at least three minutes for the phone. By how much must the flow of arrivals be increased in order to justify a second booth?
(d) Find the average number of units in the system.

OR

8. A manufacturer of personal computers purchases hard disk drives from a supplier. The factory operates 52 weeks per year, and requires assembling 100 disk drives into computers per week. The holding cost rate is 20 percent of the value (based on purchase cost) of the inventory. Regardless of the order size, the administrative cost of placing an order with the supplier has been estimated to be Rs.50. A quantity discount is offered by the supplier for large orders as shown below, where the price for each category applies to every disk drive purchased.

Discount Category	Quantity Purchased	Price (per disk drive)
1	1 to 99	Rs.100
2	100 to 499	Rs. 95
3	500 or more	Rs. 90

a) Determine the optimal order quantity according to the EOQ model with quantity discounts. What is the resulting total cost per year?

b) With this order quantity, how many orders need to be placed per year? What is the time interval between orders?

UNIT–V

9. Define Simulation? How do you apply the simulation technique to solve queuing problems?

OR

10. Solve the following LPP by dynamic programming:

Maximize $Z = 8x_1+7x_2$

Subject to

$2x_1+x_2 \le 8$,

$5x_1+2x_2 \le 5$,

$x_1, x_2 \ge 0$.

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Hall Ticket Number :										

R-15

Code: 5G579

IV B.Tech. I Semester Regular & Supplementary Examinations November 2019

Rapid Prototyping

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Explain RP process chain with neat sketch. 7M

   b) Distinguish between traditional prototyping and rapid prototyping. 7M

OR

2. a) What is Rapid Prototyping and explain about different steps involved in Rapid Prototyping technology. 7M

   b) Describe the benefits and limitations of Rapid Prototyping. 7M

UNIT–II

3. Briefly explain the stereo lithography process with neat sketch and what are the process parameters of SLA system that influence the part quality? 14M

OR

4. Explain the working principle with a neat diagram, process details and applications of Fused Deposition Modeling (FDM). 14M

UNIT–III

5. a) List out the applications, advantages and disadvantages of laminated object manufacturing (LOM)? 7M

   b) Write the models and specifications of different LOM machines used. 7M

OR

6. With a neat sketch, explain the construction and operation of SGC technique. 14M

UNIT–IV

7. What are different types of materials available for the SLS system? What are their respective applications? 14M

OR

8. With a neat sketch, explain the following concept modelers
   (i) Sander's model maker
   (ii) Thermal jet printer 14M

UNIT–V

9. a) Classify direct rapid tooling method. 7M

   b) Differentiate soft tooling and hard tooling. Compare direct tooling and indirect tooling. 7M

OR

10. Explain with a neat sketch, principle of operation of LENS Process. 14M

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Hall Ticket Number :										

R-15

Code: 5G577

IV B.Tech. I Semester Regular & Supplementary Examinations November 2019

Unconventional Machining Process

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) What are the various types of energy sources used in non-traditional machining techniques? Give examples for each 7M

   b) Differentiate the conventional and unconventional machining processes in terms of principles. 7M

OR

2. a) Explain the factors, which influence the metal removal rate in USM. Explain briefly. 7M

   b) What are the basic requirements of tool feed mechanism in USM process? Explain 7M

UNIT–II

3. a) Explain the different variables that influences the rate of metal removal and accuracy in Abrasive Jet Machining? 7M

   b) What is the principle of WJM? Describe the working of a WJM system with a neat sketch. 7M

OR

4. a) Write the factors that affects the performance of WJM process. Discuss their effects in brief. 7M

   b) Write short notes on abrasives used in Abrasive Jet Machining (AJM). 7M

UNIT–III

5. a) Write a short note on the types of reactions in Electro Chemical Machining (ECM). 7M

   b) Explain the process of metal removal in Electro Chemical Grinding 7M

OR

6. a) Explain the electrochemical deburring and honing processes in detail. 7M

   b) Calculate the metal removal rate in mm3/min in Electrochemical machining of a material having density 8000 kg/m3, atomic wt 56, valence 2 when current used is 1000 A and Faraday constant is 96500 columb/mole. 7M

UNIT–IV

7. a) Explain the Electro discharge machining process with a neat sketch. 7M

   b) Explain about R-C relaxation circuit used in EDM process 7M

OR

8. a) What do you mean by recast layer with reference to the EDM? 7M

   b) Name some of the dielectric fluids commonly used in EDM. Name some of the tool material used in EDM. 7M

UNIT–V

9. a) Compare EBM and LBM on the following aspects:
   (i) Machining rate
   (ii) Tool wear rate
   (iii) Accuracy. 7M

   b) Describe how the laser beam is used for machining? Enumerate the advantages and limitations of the process. 7M

OR

10. a) What are the advantages of water circulation in the torch of the PAM? 7M

    b) Can you machine electrically non-conducting materials using EBM process? Explain. 7M

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Hall Ticket Number :										

R-15

Code: 5G576

IV B.Tech. I Semester Regular & Supplementary Examinations November 2019

Automation and Robotics

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. Specify the reasons for automation and explain the strategies to be followed to implement the automation effectively in manufacturing industry. 14M

OR

2. A 20-station transfer line is divided into two stages of 10 stations each. The ideal cycle time of each stage is 1.2 minute. All of the stations in the line have the same probability of stopping is 0.005. We assume that the downtime is constant when a breakdown occurs, T_d = 8.0 minute. Using the upper-bound approach, compute the line efficiency for the following buffer capacities: (a) b = 0, (b) b = infinity (c) b = 5. 14M

UNIT–II

3. a) Explain the factors which may improve the line performance beyond that what the line balancing algorithms provide. 8M

   b) Balance the line by applying the largest candidate rule algorithm for the data given in the table below and sketch the balanced workstations along with their precedence relationship.

   Table 1 Work elements with processing time and their precedence relationship.

Work element number	Processing time (min)	Precedence task number
1	3	--
2	3	--
3	3	--
4	2	1,2,3
5	6	4
6	7	4
7	5	5
8	4	6
9	8	8
10	4	8
11	2	7
12	9	9,10,11

6M

OR

4. The table below defines the precedence relationship and element times for a new model toy (a) construct the precedence diagram for this job. (b) If the ideal cycle time = 1.1 minute, repositioning time = 0.1 minute and uptime proposition is assumed to be 1.0, what is the theoretical minimum No. of workstations required to minimize the balance delay under the assumption that there will be one worker per station? (c) Use the ranked positional weights method to assign work elements to the stations. (d) Compute the balance delay for your solution.

Work element	1	2	3	4	5	6	7	8	9	10
Time to perform work element, Te (min)	0.5	0.3	0.8	0.2	0.1	0.6	0.4	0.5	0.3	0.6
Immediate Predecessors	–	1	1	2	2	3	4,5	3,5	7,8	6,9

14M

UNIT–III

5. Explain different types of robot configurations. Explain the features of each type with applications. 14M

OR

6. a) What are the factors considered in designing and selection of the grippers? 7M

   b) Define degree of freedom for a robot joint? Explain various robot characteristics. 7M

UNIT–IV

7. a) What are homogeneous transformations in Robot kinematics? For a vector 20 i + 25 j + 10 k, perform a translation by a distance of 8 units in x direction, 7 units in y direction and 4 units in z direction. 9M

   b) Explain forward and reverse kinematics of a Robot? 5M

OR

8. Explain the Langrange-Euler formulation for a 2 degree of freedom robot. 14M

UNIT–V

9. a) State the importance of the sensors in robotics. Explain about the Tactile sensors. 7M

   b) What are the various type of robot programming? Discuss in detail about lead through programming 7M

OR

10. a) Explain with neat sketch the application of robot in material loading and unloading. 7M

    b) Explain the working principle of any one velocity sensor. 7M

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Hall Ticket Number :										

R-15

Code: 5G572

IV B.Tech. I Semester Regular & Supplementary Examinations November 2019

Automobile Engineering

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. Draw neat sketch of layout of an automobile with front wheel drive and rear wheel drive. 14M

OR

2. a) Explain the construction and working of Turbocharger with a neat sketch 7M

   b) List the factors that limit the extent of supercharging of S.I and C.I engines 7M

UNIT–II

3. a) Give short notes on gasoline injection 4M

   b) What are the requirements of fuel injection systems? Describe the individual Pump fuel injection system with a suitable sketch. 10M

OR

4. Examine briefly about the biomass and hydrogen and advantages of biomass over hydrogen. 14M

UNIT–III

5. With the help of neat sketches explain in detail about Battery Ignition Systems, Magneto coil Ignition Systems and Electronic Ignition Systems 14M

OR

6. Sketch and explain different types of cooling systems used in automotive engines 14M

UNIT–IV

7. a) Illustrate the principle of working of torque convertor with neat sketch 7M

   b) Explain the differential of an automobile with a neat sketch. 7M

OR

8. Explain the types of clutch. And with neat diagram explain the working principle of centrifugal clutch. 14M

UNIT–V

9. With the aid of neat sketches, Explain in detail about construction and working of Pneumatic and vacuum braking system 14M

OR

10. Explain the working of the steering system with neat sketches. List out the limitations, and Compare ‘under steering’ & ‘over steering’? 14M

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