Hall Ticket Number :

Code : 1G576

IV B.Tech. I Semester Supplementary Examinations May 2017
Advanced Manufacturing Systems
(Mechanical Engineering)

Max. Marks: 70   Time: 03 Hours

Answer *any five* questions
All Questions carry equal marks (**14 Marks** each)
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1. a) Compare and contrast various types of Manufacturing Systems   8M

   b) Describe the influence of Manufacturing strategies on business competitiveness   6M

2. a) Describe the methodology to be followed for developing a retrieval type of CAPP system   8M

   b) Explain the role of computer networking in improving the productivity of a manufacturing firm   6M

3. a) Discuss the importance of Master Production Scheduling in an MRP system   6M

   b) What is the need for DBMS? Briefly explain the architecture of DBMS   8M

4. a) List out various types of CMM? With a neat diagram explain any one type of CMM   8M

   b) Classify the types of simulation in manufacturing   6M

5. a) What is FMS? What are the components of FMS   8M

   b) Explain the economic aspects involved with Flexible Manufacturing System   6M

6. a) Differentiate CNC and DNC machines   6M

   b) What are AGV's? Briefly explain the types of AGV's   8M

7. a) Briefly explain the major elements of Automated Storage System   8M

   b) Explain the role of Robots in Flexible Manufacturing System   6M

8. a) Explain the role of expert systems in Flexible Manufacturing System   8M

   b) "Effective Decision Support System is the key for productive manufacturing"- Justify   6M

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Hall Ticket Number :

Code: 1G574

R-11/R-13

IV B.Tech. I Semester Supplementary Examinations May 2017
Automation and Robotics
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer *any five* questions
All Questions carry equal marks (**14 Marks** each)
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1. a) Distinguish between flexible automation and programmable automation.   7M
   b) (i) What is peg-in-hole assembly?   2M
      (ii) Show the schematic diagram of peg-in-hole and multiple peg-in-hole insertion.   2M
      (iii) Mention the relevance of multiple peg-in-hole insertion in the manufacture of electronic PC boards.   2M

2. a) With a schematic diagram, outline the relevance of linear part-transfer and briefly describe ANY TWO mechanisms for the purpose.   10M
   b) What is a storage buffer in a production line?   4M

3. Figure Q3 shows a precedence diagram that contains a number of nodes and arrows.
   (i) Briefly outline the information available in the diagram, and
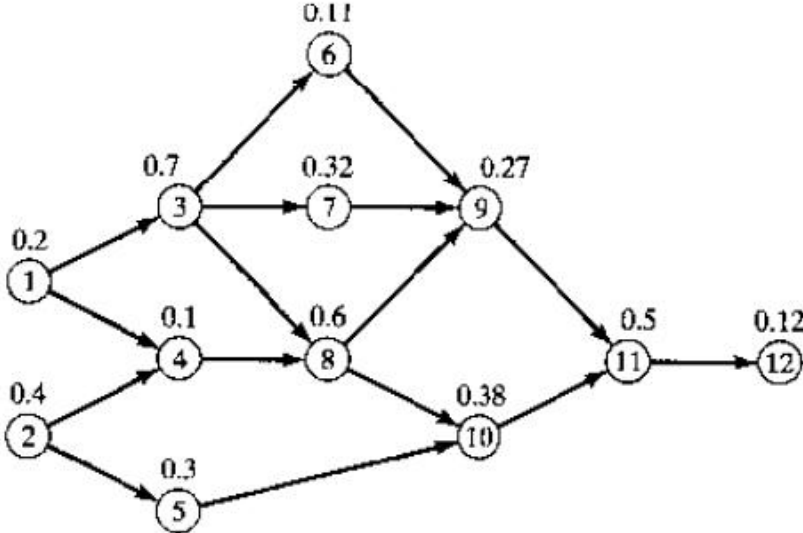   (ii) Outline how such a precedence diagram is useful in assembly line balancing.

Figure Q3: Precedence Diagram   14M

4. a) (i) What is meant by the term "degrees of freedom" of an industrial manipulator?   2M
      (ii) With a schematic diagram, illustrate pitch, yaw and roll motions of an end effector.   6M
   b) (i) Gantry robot is an example of the Cartesian type of industrial manipulator. With a schematic diagram, describe the principle of operation of the Gantry robot.   5M
      (ii) Also, state the application of the gantry robot.   1M

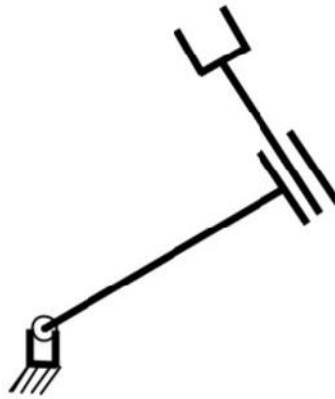5. a)   Consider the planar two-link 2-dof RP manipulator shown in Figure Q5.

Figure Q5: Two-link RP manipulator

    (i)   Assign the joint axes as per DH convention.   2M
    (ii) Prepare the DH parameter table.   2M
    (iii) Identify which of the joint parameter is variable for each of the two joints.   2M

  b)   Outline ANY ONE method of deriving equations of motion of a robot manipulator.   8M

6. a)   Distinguish between Point-to-point motion and continuous path motion.
     (Also, provide schematic figures as necessary.)   9M

  b)   (i)   What is the role of the teach pendant in robot programming?
      (ii) What is the function of the "dead-man's switch" in a teach pendant?   5M

7. a)   An air cylinder is to be used to actuate the translational joint of a robot manipulator. The piston diameter is 50 mm, the air pressure is 500 kPa (assumed constant), and the airflow rate is 0.01 m^3/minute. Determine the following:

     (i) The force generated by the piston   3M
     (ii) The velocity during the forward stroke.   3M

  b)   Describe the principle of operation of an absolute encoder.   8M

8. a)   With a schematic diagram, describe remote-centre assembly.   8M

  b)   What is meant by seam-line tracking in robotic welding? Briefly outline ANY ONE method of seam-line tracking.   6M

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IV B.Tech. I Semester Supplementary Examinations May 2017
Finite Element Methods
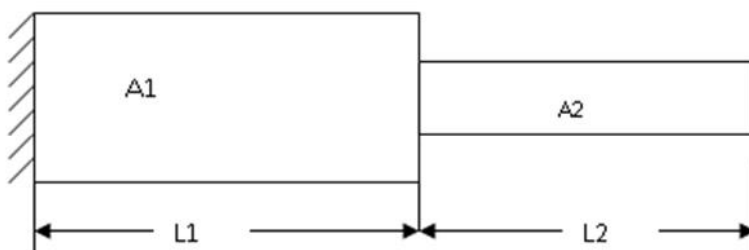(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer any *five* questions
All Questions carry equal marks (**14 Marks** each)
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1. a) Explain the equilibrium state of the system, when the system is subjected to different types of loads and explain the stress and equilibrium relations.   7M

   b) Derive the stiffness matrix based Galerkin approach and discuss the salient features of the method.   7M

2. a) Derive the strain displacement relation matrix for the 1 D axial bar element with quadratic function.   5M

   b) Calculate displacement vector, stresses and reaction for the following figure. Take E = 2 E 5 N/mm²

   9M

3. a) Derive the stiffness matrix and load vector for the space truss element from the first principles.   7M

   b) The coordinates of the space truss element is given as 1(0,0,0) and 2(20,35,65) mm has the displacement values {-0.03 0.02 -0.01 -0.03 0.02 0.2}^{T} mm with the material properties 200 GPa Youngs Modulus. Calculate the stiffness matrix, load vector and strain energy if the cross sectional area of the truss is 100 mm².   7M

4. a) What is the polynomial function choosen for the beam element? Derive the corresponding shape functions.   4M

   b) A beam is fixed at one end and supported by a roller at the other end, has a 20 kN concentrated load applied at the centre of the span of 10 m. Calculate the deflection and slope and also construct shear force and bending moment diagrams. Take I = 2500 cm⁴ and E = 20 x 10⁶ N/cm².   10M

5. a) What are different boundary conditions associated with a triangular element? Explain the method to consider those boundary conditions in the solution   8M

   b) The nodal coordinates of a triangular element are 1(10,30), 2(50,30) and 3(40,60) mm. At a point p inside the element, the x-coordinates is 33 mm and the shape function N_1 = 0.3. Determine the shape functions and y-coordinates of the point P.   6M

6. a) Derive the shape functions for four noded quadrilateral element in terms of natural coordinate system.   8M

   b) Solve the following integral equation using one point, two point and three point Gaussian quadrature methods and compare with the exact solution.

   $(1/1+x^3) + 3e^x$ dx with the limits from -1 to +1.   6M

7. a) Heat is generated in a large plate(K=0.8W/m K) at the rate of 4000 W/m³ the plate is 25 cm thick , the outside surface of the plate are exposed to ambient air at 30°C with a convective heat transfer coefficient of 20W/m² K. Determine the temperature distribution in the wall.   7M

   b) How to incorporate the convective boundary conditions for the fin? Explain in detail.   7M

8 a) Derive the constituent mass matrices for the bar element and beam element.   5M

   b) Determine Eigen values and Eigen vectors for the stepped bar as shown in figure. E=30 x10⁶ N/m², Specific weight = 0.283 kg/m³; A_1= 1 m²; A_2= 0.5 m²; L_1=10 m; L_2 = 5 m.

   9M

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IV B.Tech. I Semester Supplementary Examinations May 2017

Operations Research

(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

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1.   Solve the following problem

Maximize, $Z=6x_1+7x_2+5x_3$

Subject to constraints

$24x_1+30x_2+20x_3 \quad 1200$

$25x_2+15x_3 \quad 600$

$50 x_1+25x_3 \quad 1500$

$x_1, x_2, x_3 \quad 0$ 14M

2. a)   Describe the transportation problem with its general mathematical formulation.   4M

   b)   Find the optimum solution to the transportation problem given in figure. 1 for which the cost, origin-availabilities, and destination-requirements are given.

Fig.1   10M

3. a)   State some of the simple replacement policies and explain about any one policy in brief.   4M

   b)   A factory has a large number of bulbs, all of which must be in working condition. The mortality of bulbs is given in the following table:

Week	1	2	3	4	5	6
Proportion of bulbs	0.10	0.15	0.25	0.35	0.12	0.03

If a bulb fails in service, it cost Rs.3.50 to replace; but if all the bulbs are replaced at a time it costs Rs.1.20 each. Find the optimum group replacement policy.   10M

4. a) What are the assumptions made in the theory of games? 4M

   b) Solve the game given in figure 2 by reducing to 2 × 2 game by graphical method.

Player B

		I	II
Player A	I	-6	7
	II	4	-5
	III	-1	-2
	IV	-2	5
	V	7	6

Figure 2 10M

5. A tax consultant firm has 3 counters in its office to receive people who have problems concerning their income, wealth and sales taxes. On the average 48 persons arrive in 8 hour day. Each tax advisor spends 15 minutes on the average on an arrival. If the arrivals poissonly distributed and service times are according to exponential distribution. Find

   a) The average number of customers in the systems

   b) Average number of customers waiting to be serviced

   c) Average time a customer spends in the system

   d) Average waiting time for a customer

   e) The probability that a customer has to wait before he gets service. 14M

6. a) Discuss about significance of inventory. 4M

   b) A stockiest purchases an item at the rate of Rs. 40 per piece from a manufacturer. 2,000 units of the item are required per year. What should be the order quantity per order if the cost per order is Rs.15 and the inventory charges per year are 20 per cent? 10M

7. a) Define Bellmen's principle of optimality. 7M

   b) Discuss about application of dynamic programming. 7M

8. Define simulation. Discuss about limitations of simulation. 14M

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IV B.Tech. I Semester Supplementary Examinations May 2017
Un conventional Machining process
(Mechanical Engineering)

Max. Marks: 70   Time: 03 Hours

Answer *any* ***five*** questions
All Questions carry equal marks (**14 Marks** each)
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1. a) Defend the need for the development of non-traditional machining methods.   8M
   b) Explain the influence of work material on the choice of a non-conventional machining method.   6M

2. a) With the help of a line diagram describe the structure of the horn of an ultrasonic machine and explain its working.   8M
   b) Discuss about the recent developments in ultrasonic machining.   6M

3. a) Describe and characterize the individual elements of a water jet machine.   7M
   b) List out the applications and limitations of abrasive jet machining.   7M

4. a) Derive an equation for metal removal rate in electro chemical machining.   8M
   b) Explain the working principle of electro chemical grinding.   6M

5. a) List out the process parameters related to electric discharge machining and explain their influence on the metal removal.   8M
   b) Derive equations for metal removal rate and surface roughness in electric discharge machining.   6M

6. a) Compare and contrast thermal and non-thermal processes.   6M
   b) Comment about the cutting speed and accuracy of cut in laser beam machining.   8M

7. a) Explain the influence of process parameters on the machining efficiency in plasma machining.   7M
   b) Comment about the factors to be considered while selecting the maskants for chemical machining.   7M

8. a) With the help of line diagram explain magnetic abrasive finishing.   8M
   b) Discuss the applications of rapid prototyping.   7M
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