

Code: 4G574

IV B.Tech. I Semester Supplementary Examinations May 2018

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)

UNIT-I

1. a) What are the various automation strategies and explain any one?
- b) List the basic elements of automated system and explain any one.

OR

2. a) Define automation. List the need for automation.
- b) Explain the organization and information processing in manufacturing

UNIT-II

3. Apply the Ranked Positional Weight method for below Fig.1 and determine the following.
(i). Balancing Efficiency, (ii). Balance delay and (iii) Smoothness index

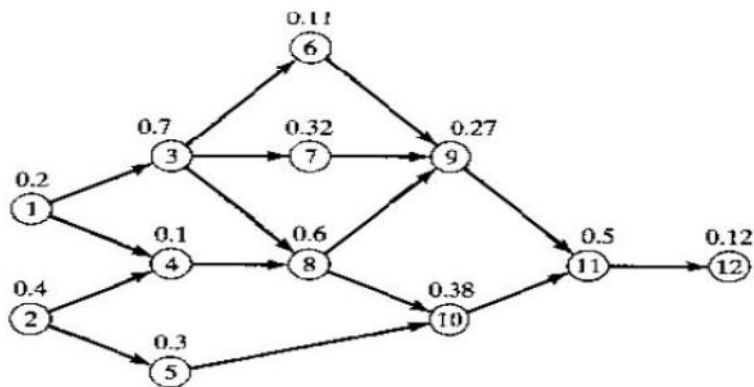


Figure Q3: Precedence diagram.

4. Draw the precedence diagram and determine the no of workstations required by using Kilbridge & Wester method for the assembly line problem outlined in below Table. Also calculate its balancing efficiency and balance delay.

Work Element (j)	T _{ej} (min)	Must be preceded by
1	0.2	-
2	0.4	-
3	0.7	1
4	0.1	1,2
5	0.3	2
6	0.11	3
7	0.32	3
8	0.6	3,4
9	0.27	6,7,8
10	0.38	5,8
11	0.5	9,10
12	0.12	11

UNIT-III

5. Classify robot configuration.

OR

6. List the factors considered in design of grippers.

UNIT-IV

7. Explain forward and inverse kinematics with reference to robots.

OR

8. Explain trajectory planning system with reference to robots.

UNIT-V

9. List the different motion commands.

OR

10. Give the different applications of robot in manufacturing industries.

Code: 4G572

IV B.Tech. I Semester Supplementary Examinations May 2018

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)

UNIT-I

1. a) What are the essential requirements to be satisfied by material for the following automobile engine components? Piston, Piston rings, Cylinder block, Connecting rod, Crankshaft, Inlet & Exhaust valves. 7M
- b) Discuss the effect of supercharging on power output, mechanical efficiency and specific fuel consumption of an automobile. 7M

OR

2. a) With a neat sketch explain Bendix drive starting mechanism. 7M
- b) Explain the working of horn and wiper in an automobile engine. 7M

UNIT-II

3. a) List the various parts of fuel feed system of a car. Draw a diagram showing these parts in respective positions. 7M
- b) Illustrate the construction and working principle of a fuel injector. 7M

OR

4. a) What are the main sources of pollutants from gasoline engines? 7M
- b) Explain various techniques to control NOx emissions from automobiles. 7M

UNIT-III

5. a) How engines are air cooled? What is the purpose of fins in an air cooled system? What is the size and spacing of fins? 7M
- b) Explain how pressure sealed cooling system is different from conventional water cooling system. 7M

OR

6. a) Explain how the high voltage required for sparking is built up by the battery ignition system? 7M
- b) Describe with diagram, the magneto ignition system. 7M

UNIT-IV

7. a) What is purpose of over drive in automobiles? Explain. 7M
- b) Explain the working of different types of rear axles. 7M

OR

8. a) Explain the applications of overdrive in automobile sector. 7M
- b) How turning radius of a vehicle is related to differential? Explain. 7M

UNIT-V

9. With neat sketches explain types of steering gear and give the application of each. 14M

OR

10. a) Why disc brakes are preferable at the front side of the vehicle? Explain 4M
- b) Explain different types of suspension system with neat sketches 10M

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R-14

Code: 4G576

IV B.Tech. I Semester Supplementary Examinations May 2018

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)

UNIT-I

1. a) What are the major elements of FMS? State the applications of FMS. 8M
b) Compare and Contrast: Flexible Manufacturing System with Flexible Manufacturing Cell. 6M

OR

2. a) Explain the hierarchy of the CIM. 5M
b) Justify the need, benefits and limitations of FMS. 9M

UNIT-II

3. a) Why Just-in-time (JIT) Production system is termed as pull system? Explain its types. 7M
b) What method used for forming cells in group technology? Explain with an example? 7M

OR

4. a) What is Just-in-time (JIT) Production? What are the benefits of JIT Production? 8M
b) State the applications of Group Technology. 6M

UNIT-III

5. a) What do you mean by AVG? Explain its practical applications in industries. 7M
b) Explain how automated inspection is useful in industries with suitable example. 7M

OR

6. a) Define DNC. Explain the application of DNC in machine tool control unit. 7M
b) Write short notes on transfer line with and without internal storage. 7M

UNIT-IV

7. a) Detail about the issues in manufacturing system flexibility. 6M
b) Enumerate the tests involved in checking the flexibility in an automated manufacturing system and explain. 8M

OR

8. a) Distinguish flexible manufacturing systems based on the type of operations they perform. 7M
b) Compare four criteria of flexibility in a manufacturing system and the seven types of flexibility. 7M

UNIT-V

9. a) What are the basic requirements that must be managed by the controller to achieve real-time control? 7M
b) State the role of Information technology in FMS. 7M

OR

10. a) Discuss FMS application for sheet metal fabrication. 7M
b) Discuss the economic justification of FMS. 7M

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IV B.Tech. I Semester Supplementary Examinations May 2018

Finite Element Methods

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

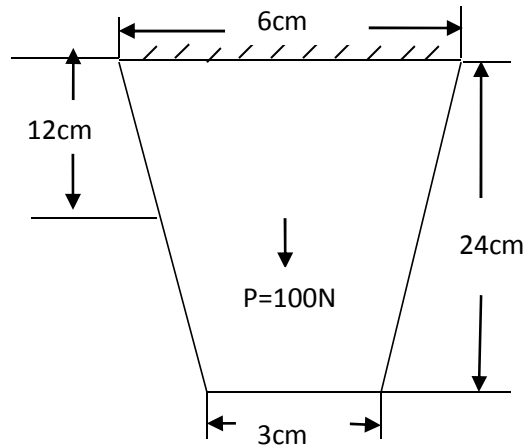
Answer all five units by choosing one question from each unit (5 x 14 = 70 Marks)

UNIT-I

1. a) Enumerate the steps involved in finite element method. 10M
 b) List out the Engineering applications of finite element method. 4M

OR

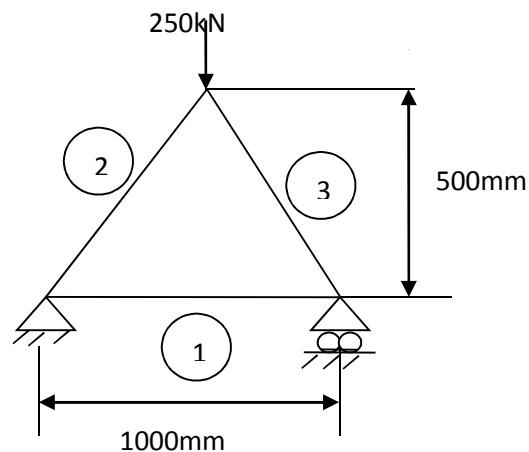
2. Consider the thin (steel) plate shown in figure. The plate has a uniform thickness $t=10\text{mm}$, Young's modulus $E=20 \times 10^9 \text{N/m}^2$.
 a) Using the elimination approach, solve for the global displacement vector
 b) Evaluate the stresses in each element.
 c) Determine the reaction force at the support.



14M

UNIT-II

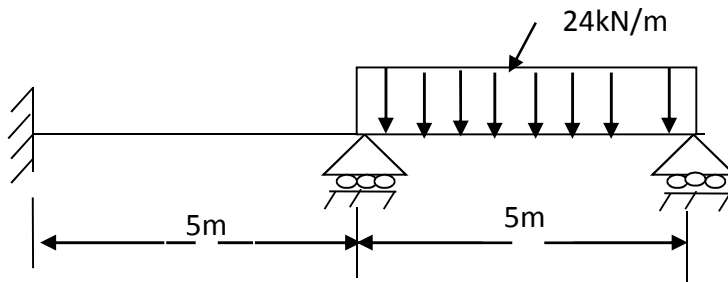
3. Consider a three bar truss as shown in figure. It is given that $E=2 \times 10^5 \text{N/mm}^2$. Calculate the following:
 (i) Nodal displacements (ii) Stress in each member
 (iii) Reactions at the support.



14M

OR

4. For the beam loaded as shown in figure, determine the slope at the simple supports. Take $E=200\text{GPa}$, $I=4\times 10^6\text{m}^4$.



14M

UNIT-III

5. The (X, Y) coordinates of the nodes of a triangular element of thickness 0.5cm are (2,4), (5,3), (3,6) cms. Its young's modulus is 200GPa. Poisson's ratio 0.3. The edge of the element formed by points (2,4), (5,3) is fixed and a load of 6kN is acting at point (3,6). Find the nodal displacement

14M

OR

6. Derive the stress-strain relationship matrix [D] for the axi-symmetric triangular element.

14M

UNIT-IV

7. Derive the element stiffness matrix for a linear iso-parametric quadrilateral element.

14M

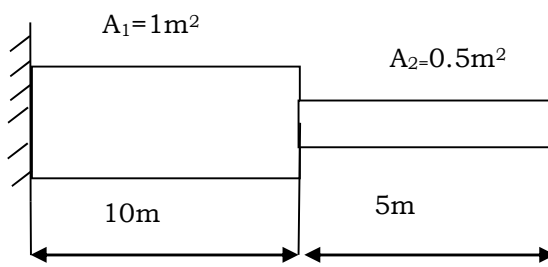
OR

8. A steel fin of diameter $d=2\text{cm}$, Length (L) = 5cm and thermal conductivity $K=50\text{W/m}^\circ\text{C}$ is exposed at one end to a constant temperature of 320°C . The other end is in ambient air of temperature 20°C with a convection co-efficient of $h= 100\text{W/m}^2\text{-}^\circ\text{C}$. Determine the temperature at the midpoint of the fin.

14M

UNIT-V

9. Determine the Eigen values and Eigen vectors for the beam shown in figure



Take:
 $E=30\times 10^5\text{N/m}^2$
 $P=0.283\text{kg/m}^3$

14M

OR

10. Find the natural frequency of a cantilever beam vibrating freely in the axial direction. The exact solution is $\omega_n = \frac{n\pi}{2l} \sqrt{\frac{E}{\rho}}$ Use lumped mass formulation.

14M

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R-14

Code: 4G571

IV B.Tech. I Semester Supplementary Examinations May 2018

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)

UNIT-I

1. An Air Force is experimenting with three types of bombs P, Q and R in which three kinds of explosives, viz., A, B and C will be used. Taking the various factors into account, it has been decided to use the maximum 600 kg of explosive A, at least 480 kg of explosive B and exactly 540 kg of explosive C. Bomb P requires 3, 2, 2 kg, bomb Q requires 1, 4, 3 kg and bomb R requires 4, 2, 3 kg of explosives A, B and C respectively. Bomb P is estimated to give the equivalent of a 2 ton explosion, bomb Q, a 3 ton explosion and bomb R, a 4 ton explosion respectively. Under what production schedule can the Air Force make biggest bang. 14M

OR

2. Use two-phase method to solve the following Linear Programming Problem.
 $Max\ Z = 3X_1 - X_2$
subject to $2X_1 + X_2 \geq 2$
 $X_1 + 3X_2 \leq 2$
 $X_2 \leq 4$
and $X_1, X_2 \geq 0$ 14M

UNIT-II

3. Goods have to be transported from sources S_1, S_2 and S_3 to destination D_1, D_2 and D_3 . The transportation cost per unit, capacities of the sources, and the requirements of the destinations are given in the following table.

	D_1	D_2	D_3	Supply
S_1	8	5	6	120
S_2	15	10	12	80
S_3	3	9	10	80
Demand	150	80	50	

Determine a transportation schedule so that cost is minimized. Use North-west corner rule to find Basic Feasible Solution. 14M

OR

4. A solicitors' firm employs typists on hourly piece-rate basis for their daily work. There are five typists and their charges and speed are different. According to an earlier understanding only one job was given to one typist and the typist was paid for a full hour, even if he worked for a fraction of an hour. Find the least cost allocation for the following data:

Typist	Rate per hour (Rs)	No. of pages typed/hour
A	5	12
B	6	14
C	3	8
D	4	10
F	4	11

Job	No. of pages
P	199
Q	175
R	145
S	298
T	178

14M

UNIT-III

5. The following mortality rates have been observed for a certain type of fuse:

Week	1	2	3	4	5
% failing by the end of week	5	15	35	57	100

There are 1000 fuses in use and it costs Rs 5 to replace an individual fuse. If all fuses were replaced simultaneously it would cost Rs 1.25 per fuse. It is proposed to replace all fuses at fixed intervals of time, whether or not they have burnt out, and to continue replacing burnt out fuses as they fail. At what time intervals should the group replacement be made? Also prove that this optimum policy is superior to the straight forward policy of replacing each fuse only when it fails.

14M

OR

6. a) Explain (i) Two-person Zero-sum game (ii) Pure strategy in a game
b) Solve the game whose payoff matrix is given below:

4M

		Player B			
		B ₁	B ₂	B ₃	B ₄
Player A	A ₁	3	2	4	0
	A ₂	3	4	2	4
	A ₃	4	2	4	0
	A ₄	0	4	0	8

10M

UNIT-IV

7. A fertilizer company distributes its products by trucks that are loaded at its only loading station. Both, company trucks and contractor's trucks are used for this purpose. It was found that on an average, every 5 minutes one truck arrived and the average loading time was 3 minutes. Out of these trucks 40 per cent being to the contractor's. Determine:

- (i) The probability that a truck has to wait.
(ii) The waiting time of a truck that waits.
(iii) The expected waiting time of the contractor's trucks per day.

14M

OR

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

Quantity (Units)	Price per Unit (Rs)
$0 < Q_1 < 100$	20
$100 \leq Q_2 < 200$	18
$200 \leq Q_3$	16

The monthly demand of the product is 400 units. The storage cost is 20 % of the unit cost and the cost of ordering is Rs 25.

14M

UNIT-V

9. Use dynamic programming to solve the following linear programming problem.

$$\text{Maximize } Z = 8X_1 + 7X_2$$

$$2X_1 + X_2 \leq 8$$

$$5X_1 + 2X_2 \leq 15$$

$$X_1, X_2 \geq 0$$

14M

OR

10. A company trading in motor vehicle spare parts wishes to determine the levels of stock it should carry for the items in the range. The demand is not certain and there is a lead time for stock replenishment. For an item A, the following information is obtained:

Demand(units/day)	3	4	5	6	7
Probability	0.10	0.20	0.30	0.30	0.10

Carrying cost (per unit/day) =Rs 2, Ordering cost (per order)=Rs 50, lead time for replenishment = 3 days. Stock on hand at the beginning of the simulation exercise was 20 units. Carry out a simulation run over a period of 10 days with the objective of evaluating the inventory rule: Order 15 units when present inventory falls below 15 units. Use random numbers in the sequence: 0, 9, 1, 1, 5, 1, 8, 6, 3, 5. Also calculate total inventory cost.

14M
