

Code: 5G577

IV B.Tech. I Semester Regular Examinations November 2018

Un Conventional 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)

UNIT-I

1. a) Explain classification of modern machining processes. 7M
 b) What are the considerations of process selection and applications of UCMP? 7M

OR

2. a) What are the types of transducers used in Ultrasonic machining? Explain their working principles. 7M
 b) Differentiate between conventional and unconventional machining processes 7M

UNIT-II

3. With a neat sketch describe the working principle and elements, advantages of abrasive jet machining. 14M

OR

4. a) Write the applications of different types of abrasives used in AWJM. 7M
 b) Write advantages, limitations and applications of Water jet machining. 7M

UNIT-III

5. a) Explain functions of electrolyte used in ECM and name three electrolytes with their specialties. 7M
 b) Explain the principle of electrochemical grinding with neat sketch. 7M

OR

6. a) Explain in detail the fundamentals and mechanism of chemical machining. 7M
 b) List out various advantages and applications of chemical machining. 7M

UNIT-IV

7. a) Explain in detail selection of tool electrode and dielectric fluids with regard to surface finish and machining accuracy in EDM. 7M
 b) List the Process parameters of EDM and explain their significance in machining. 7M

OR

8. a) Explain the Electro discharge machining process with a neat sketch. 7M
 b) Explain about R-C relaxation circuit used in EDM process 7M

UNIT-V

9. a) Describe about various process parameters effecting electron beam machining process. 7M
 b) State the mechanism of metal removal, merits and demerits of laser beam machining process. 7M

OR

10. a) Explain about plasma arc machining process with a neat sketch. 7M
 b) Describe process of Electron beam machining with neat sketch 7M

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| R-15 |
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Code: 5G576

IV B.Tech. I Semester Regular Examinations November 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)

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| UNIT-I |
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1. Explain the various types of automation systems with respect to features and configurations. Also explain their relative position with respect to product variety and production volume. 14M

OR

2. a) 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: (i) $b = 0$, (ii) $b = 10$. 10M
- b) Enlist the reasons for a down time in automated production line. 4M

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| UNIT-II |
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3. What is need for line balancing in assembly processes? Explain the factors which may improve the line performance beyond that what the line balancing algorithms provide. 14M

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, T_e (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

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| UNIT-III |
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5. a) Explain the different types of grippers. 7M
b) Explain the components of the robotic system. 7M

OR

6. What is robotics? Explain different types of robot configurations. Explain the features of each type with applications. 14M

UNIT-IV

7. Explain the Lagrange-Euler formulation for a 2 degree of freedom robot. 14M

OR

8. a) Explain briefly about manipulator path control motions. 5M
b) What are homogeneous transformations in robot kinematics? For a vector $20\mathbf{i} + 25\mathbf{j} + 10\mathbf{k}$, perform a translation by a distance of 8 units in x direction, 7 units in y direction and 4 units in z direction. 9M

UNIT-V

9. a) Explain the Inductive proximity sensors. 7M
b) Explain with neat sketch the application of robot in material handling. 7M

OR

10. a) Explain with a neat sketch about application of robot in any assembly operation. 7M
a) Explain the working principle of any one position sensor. 7M

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R-15

Code: 5G572

IV B.Tech. I Semester Regular Examinations November 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) Write the functions of 4 wheeler automobile brake. 4M
- b) Explain about turbo charging and super charging. 10M

OR

2. a) Write the components of four wheeler automobile. 4M
- b) With the help of neat diagrams explain the working of horn and wiper in an automobile. 10M

UNIT-II

3. a) Explain the working principle of a simple carburetor. 6M
- b) With the help of a neat diagram explain the function of a distributor type fuel pump. 8M

OR

4. a) List the advantages of CNG. 4M
- b) What are the merits and demerits of LPG as an automobile fuel? 10M

UNIT-III

5. a) Explain why engines should not be sub cooled. 4M
- b) Explain the working of Forced Circulation Cooling System with the help of a neat sketch 10M

OR

6. a) Discuss about the spark advance and retard mechanisms 4M
- b) Draw the layout of electronic ignition system. Explain the function of each component. 10M

UNIT-IV

7. a) What are various advantages of multiplate clutch over single plate clutch. 4M
- b) Write about functions of a propeller shaft and explain Hotch – Kiss drive? 10M

OR

8. a) Explain various functions of transmission system. 4M
- b) Explain the working of synchromesh gear box with the help of a neat diagram. 10M

UNIT-V

9. a) Write about requirements of brake fluid? 4M
- b) Sketch the arrangement of pneumatic braking system used in automobiles and explain? 10M

OR

10. a) Discuss about antilock braking system. 4M
- b) Explain about steering geometry in detail? 10M

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R-15

Code: 5G575

IV B.Tech. I Semester Regular Examinations November 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. Define manufacturing system? Explain the functions of various components in manufacturing system. 14M

OR

2. Explain
i) Level of automation ii) System flexibility iii) System layout 14M

UNIT-II

3. a) Write the principles of just-in-time production system. 7M
b) Write the steps in rank-order clustering algorithm. 7M

OR

4. a) List out the types of kanbans and Explain. 7M
b) Define cellular manufacturing. What are the manufacturing conditions under which cellular manufacturing is most suitable. 7M

UNIT-III

5. a) Define lean manufacturing. Explain the steps involved in lean manufacturing. 7M
b) How to reorganize the production system for agility. 7M

OR

6. a) Why just-in-time production required in lean manufacturing? 7M
b) How managing relation are maintained for agility. 7M

UNIT-IV

7. Name three production situations in which FMS technology can be applied. Explain these production systems with examples. 14M

OR

8. What is carousel system? Explain the two storage location strategies? 14M

UNIT-IV

9. a) Draw and explain the basic structure of expert system? 7M
b) Explain How expert system is useful for FMS with a case study. 7M

OR

10. a) Explain knowledge based system with suitable sketch. 7M
b) Describe the elements of artificial intelligence. Is machine vision a part of it? Explain. 7M

Code: 5G573

IV B.Tech. I Semester Regular Examinations November 2018

Finite Element Methods
(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

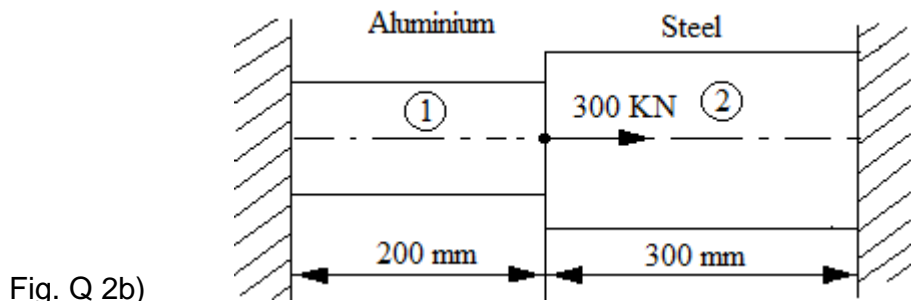
Answer all five units by choosing one question from each unit (5 x 14 = 70 Marks)

UNIT-I

1. a) What is FEM? List out the Engineering applications of Finite Element Method. 6M
- b) Explain plane stress and plane strain problem with examples and write the relation between stress and strain. 8M

OR

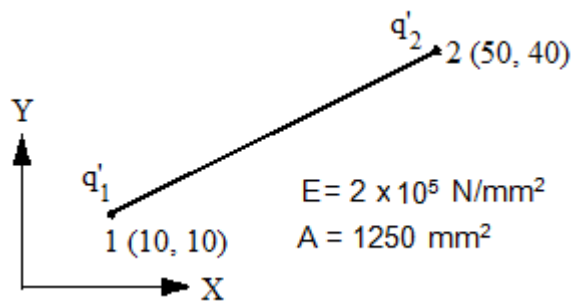
2. a) Starting with shape functions, derive the element stiffness matrix for 1D quadratic element. 4M
- b) An axial load $P = 300 \text{ KN}$ is applied at 20°C to the rod as shown in the Fig. Q 2(b). The temperature is then raised to 60°C .
 - i) Assembly the global stiffness matrix (K) and global load vector (F).
 - ii) Determine the nodal displacements and element stresses.



$E_1 = 70 \times 10^9 \text{ MPa}, \quad E_2 = 200 \times 10^9 \text{ MPa},$
 $A_1 = 900 \text{ mm}^2, \quad A_2 = 1200 \text{ mm}^2$
 $\alpha_1 = 23 \times 10^{-6}/^\circ\text{C}, \quad \alpha_2 = 11.7 \times 10^{-6}/^\circ\text{C}$
10M

UNIT-II

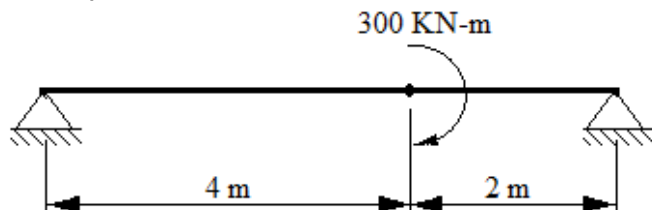
3. a) Obtain the stiffness matrix for the truss element. 7M
- b) Consider the truss element shown in Fig. 3 (b). The x, y co-ordinates of the two nodes is indicated in the Fig. Q3(b). If $q = [0.38, 0.25, 0.53, 1.1]^T \text{ mm}$, determine the following.
 - i. the vector q'
 - ii. the stress in the element and
 - iii. the stiffness matrix of the element



7M

OR

4. A simply supported beam of span 6m and uniform flexural rigidity $EI=40,000\text{kN-m}^2$ is subjected to clockwise couple of 300 kN-m at a distance of 4m from the left end as shown in the Fig. Q4. Find the deflection at the point of application of the couple and internal loads.



14M

UNIT-III

5. a) Derive the shape functions for triangular element (CST element) in natural co-ordinate system. 9M
- b) A model co-ordinate of the triangular element is as shown in Fig. Q5(b). At the interior point 'P' the co-ordinate is 3.3 and $N_1 = 0.3$. Determine ' N_2 ' and the y co-ordinate at point 'P'.

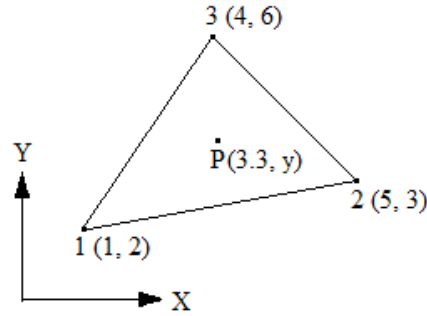


Fig. Q5(b)

5M

OR

6. Derive strain displacement [B] matrix for axisymmetric 3 noded CST element 14M

UNIT-IV

7. a) Derive an expression for Jacobean matrix for a four noded quadrilateral element 8M
- b) Explain the concept of ISO, sub and super parametric elements and their uses. 6M

OR

8. Determine the temperature distribution through composite wall, subjected to convection heat transfer on the right side surface, with convective heat transfer coefficient shown in Fig. Q8. The ambient temperature is -5°C . Assume unit area.

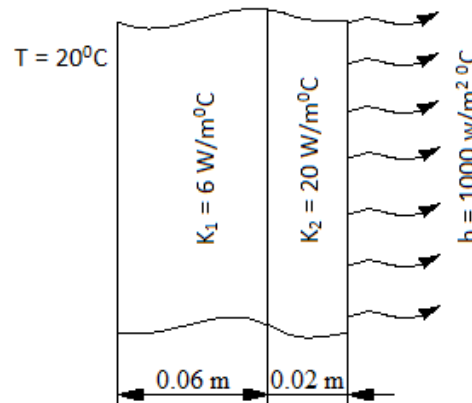


Fig. Q8

14M

UNIT-V

9. Derive the lumped matrix formulation for bar and beam element. 14M

OR

10. Find the lowest Eigen value and the corresponding Eigen mode for the beam shown in Fig. Q10

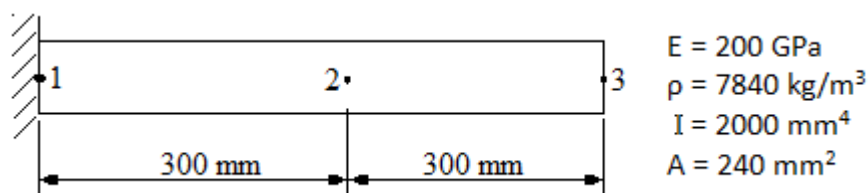


Fig. Q10

14M

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R-15

Code: 5G571

IV B.Tech. I Semester Regular Examinations November 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. a) Solve the following LPP:
 Minimize $Z = 4x_1 + 3x_2 + x_3$
 Subject to $x_1 + 2x_2 + 4x_3 \geq 12$
 $3x_1 + 2x_2 + x_3 \geq 8$
 $x_1, x_2, x_3 \geq 0$ 10M
- b) Discuss the various phases in solving an OR problem 4M

OR

2. Solve the following LP problem graphically:
 Minimize $Z = 6x_1 - 4x_2$
 Subject to the constraints:
 $2x_1 + 3x_2 \geq 30$
 $3x_1 + 2x_2 \leq 24$
 $x_1 + x_2 \geq 3$ and $x_1, x_2 \geq 0$ 14M

UNIT-II

3. Find the optimal solution for the following transportation problem

| | | Destination | | | | Supply |
|--------|--------|----------------|----------------|----------------|----------------|--------|
| | | D ₁ | D ₂ | D ₃ | D ₄ | |
| Origin | O1 | 11 | 13 | 17 | 14 | 250 |
| | O2 | 16 | 18 | 14 | 10 | 300 |
| | O3 | 21 | 24 | 13 | 10 | 400 |
| | Demand | 200 | 225 | 275 | 250 | 950 |

14M

OR

4. A machine operator processes five type of items on his machine each week and must choose a sequence for them. The set-up cost per change depends on items presently on the machine and the setup to be made according to the following table. If he processes each type of item once and only once in each week, how should he sequence the items on his machine in order to minimize the total set-up cost?

| | | To item | | | | |
|-----------|---|---------|-------|-------|-------|-------|
| | | A | B | C | D | E |
| From item | A | ----- | 4 | 7 | 3 | 4 |
| | B | 4 | ----- | 6 | 3 | 4 |
| | C | 7 | 6 | ----- | 7 | 5 |
| | D | 3 | 3 | 7 | ----- | 7 |
| | E | 4 | 4 | 5 | 7 | ----- |

14M

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| UNIT-III |
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5. The following failure rates have been observed for a certain type of light bulb. The replacement of an individual bulb on failure cost Rs 1.25. The cost of group replacement is 80paise per bulb. Determine the better one among the individual and group replacement policies.

| | | | | | | | |
|-----------------------------|------|------|------|------|------|------|------|
| End of the week | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Probability failure to date | 0.05 | 0.15 | 0.25 | 0.46 | 0.68 | 0.88 | 1.00 |

14M

OR

- 6 Solve the following game

| | | | | | |
|-------------|----------|---|----|-----|----|
| Player A | Player B | | | | |
| | | I | II | III | IV |
| | I | 6 | 8 | 3 | 13 |
| | II | 4 | 1 | 5 | 3 |
| | III | 8 | 10 | 4 | 12 |
| | IV | 3 | 6 | 7 | 12 |

14M

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| UNIT-IV |
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7. a) Vehicles are passing through a toll gate at the rate of 70 per hour. The average time to pass through the gate is 45 seconds. The arrival rate and service rate follow poisson distribution. There is a complaint that the vehicles wait for a long duration. The authorities are willing to install one more gate to reduce the average time to pass through the toll gate to 35 seconds if the idle time of the toll gate is less than 9% and the average queue length at the gate is more than 8 vehicles, check whether the installation of the second gate is justified?
- b) What are the assumptions of the basic inventory model? How does each affect the model?

10M

4M

OR

8. a) What are the objectives that should be fulfilled by an inventory control system?
- b) A company uses annually 24,000 units of raw material which costs Rs.1.25 per unit. Placing each order costs Rs.22.50 and the carrying cost is 5.4% per year of the average inventory. Find the economic lot size and the total inventory cost (including cost of material). Should the company accept the offer made by the supplier of a discount of 5% on the cost price on a single order of 24,000 units?

4M

10M

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| UNIT-V |
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9. a) State the advantages and limitations of simulation
- b) Discuss briefly various types of simulation models

4M

10M

OR

10. Solve the following linear programming problem by dynamic programming:

$$\text{Max } Z = 3x_1 + x_2$$

Subject to constraints

$$2x_1 + x_2 \leq 6$$

$$x_1 \leq 2$$

$$x_2 \leq 4 \text{ and } x_1, x_2 \geq 0$$

14M

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R-15

Code: 5G579

IV B.Tech. I Semester Regular Examinations November 2018

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)

UNIT-I

1. a) With example, explain the historical development of Rapid prototyping technology. 7M
- b) List the applications of RP technology in manufacturing industries. 7M

OR

2. a) Explain the Impact of Rapid prototyping on Product Development. 7M
- b) Differentiate Subtractive Prototyping process and Additive Prototyping process. 7M

UNIT-II

3. Briefly explain the principle and process details in stereo lithography system with neat sketch. 14M

OR

4. Describe the process of fused deposition modeling and list the factors that affect the part quality. 14M

UNIT-III

5. a) What are the various LOM materials and their typical applications? 7M
- b) Write the models and specifications of different LOM machines used. 7M

OR

6. List advantages and disadvantages when rapid prototyping concept is applied to solid ground curing (SGC)? 14M

UNIT-IV

7. a) List out technical specifications of 3D printer. 7M
- b) Compare LOM with SLS with suitable reasons. 7M

OR

8. With a neat sketch, explain the following concept modelers
(i) Sander's model maker (ii) 3D Printer 14M

UNIT-V

9. Explain Beam Deposition (LENS) Rapid Prototyping process in detail with neat sketch. 14M

OR

10. a) What are different Rapid Tooling Techniques? 7M
- b) Explain silicon rubber tooling. 7M
