

Code: 1G573

IV B.Tech. I Semester Supplementary Examinations May 2018

**Finite Element Methods**

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any **five** questionsAll Questions carry equal marks (**14 Marks** each)

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1. a) What are the basic steps involved in finite element analysis and explain them briefly. 7M
- b) Write the advantages, disadvantages and limitations of FEM? 7M
2. Determine the
  - i. Nodal deflections
  - ii. Stresses in each member
  - iii. Reactions at the supports, For the member shown in the Fig.1 Given that,  $E_1 = 2 \times 10^5$  Mpa,  $E_2 = 1 \times 10^5$  MPa and  $P = 1000$  N

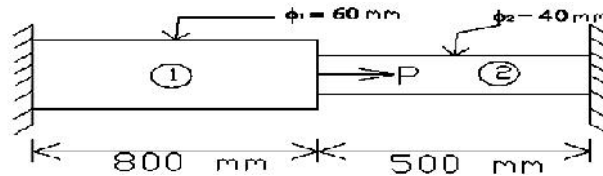
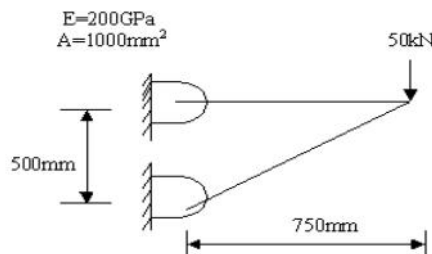


Fig.1

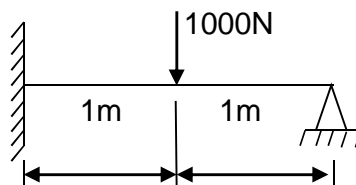
14M

3. Determine the stiffness matrix, stresses and reactions in the truss structure shown in figure.



14M

4. Solve the following problem using finite element method. Take  $E = 200$  GPa,  $I = 10^{-4}$  m<sup>4</sup>



14M

5. For a triangular plate shown in the figure 4, determine the deflection at the point of load using one triangular element. Thickness is 10mm,  $E = 70 \times 10^3$  MPa,  $\mu = 0.3$

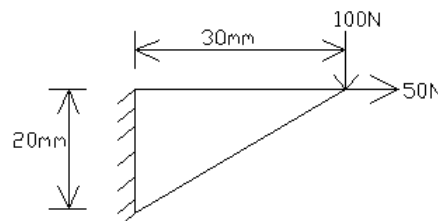


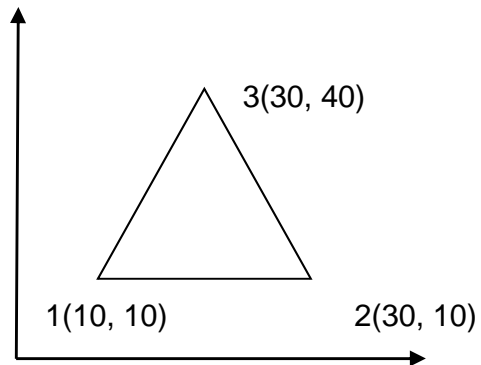
Fig. 4

14M

6. Derive the element stiffness matrix for a 4 – noded quadrilateral iso parametric element

14M

7. Nodal co-ordinates for an axi-symmetric triangular element is given below. Evaluate strain displacement matrix [B]



14M

8. Determine eigen values and eigen vectors of a stepped bar, for longitudinal vibrations using consistent mass matrix. Areas of 2 segments of bars are  $50\text{mm}^2$  and  $100\text{mm}^2$  and lengths are  $500\text{mm}$  and  $1000\text{mm}$ . Assume  $E = 200\text{GPa}$  and mass density as  $8000\text{Kg/m}^3$ . The bar is fixed at one end.

14M

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Code: 1G571

IV B.Tech. I Semester Supplementary Examinations May 2018

**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  $Z = 3x_1 + 2x_2$

Subject to constraints

$2x_1 + x_2 \leq 2$

$3x_1 + 4x_2 \leq 12$

$x_1, x_2 \geq 0$

14M

2. Solve the Following Transportation Problem

From	TO				Supply
	10	7	3	6	3
	1	6	8	3	5
	7	4	5	3	7
Demand	3	2	6	4	15

14M

3. A decision has to be made for group replacement versus individual replacement policy for 500 fluorescent tubes of a particular make in the university campus. Failure rate for the tubes were recorded as under

End of month	1	2	3	4	5	6
Prob. Of failure	0.11	0.30	0.25	0.20	0.10	0.04

Cost of replacing an individual tube is Rs.55 and when replaced as group it is Rs.35. Find out whether group replacement policy is economical or not. If economical at the end of which month should the tubes be replaced as a group?

14M

4. Solve the Game by Sub-Games method

		Player B		
		I	II	III
Player A	I	1	3	-3
	II	2	5	4

14M

5. An artist in the Shilparamam has 8 persons for whom the artist performs painting works. Arrival rate is poisson stream and the service times are exponential. Average arrival rate is 5 per hour with an average service time of 20 minutes. Cost of waiting is Rs.120 per hour, while the cost of service Rs 75 each. Calculate

- the average length of the waiting line
- the average waiting time of an arrival
- the average time which an arrival spends in the system and
- the minimum cost service rate.

14M

6. Find the optimum order quantity for the following price break inventory problem:

Annual demand: 200 units      Inventory carrying cost: 25%  
 Ordering cost: Rs 20 per order

Quantity	Price/Unit
0 $Q < 50$	Rs 10
50 $Q < 100$	Rs 9
100 $Q$	Rs 8

14M

7. Use Bellman's principle of optimality to find the optimum solution to the following problem:

$$\text{Minimize } Z = y_1^2 + y_2^2 + y_3^2$$

Subject to the constraints

$$y_1 + y_2 + y_3 = 15 \text{ and } y_1, y_2, y_3 \geq 0.$$

14M

8. a) Explain the importance of simulation in optimization

7M

- b) How do you apply simulation technique to an inventory problem

7M

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<b>R-11 / R-13</b>
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**Code: 1G578**

IV B.Tech. I Semester Supplementary Examinations May 2018

**Unconventional Machining Process**  
(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) What are the advantages and limitation of conventional machining processes over unconventional machining processes? 7M  
b) Classify the common non- traditional methods. Give a list of such operations. 7M
  
- 2. Discuss the hypothesis proposed by Shaw regarding the mode of material removal rate in ultrasonic machining and obtain an expression for machining rate. What are the assumptions on which this expression is based? 14M
  
- 3. a) With a neat sketch, explain the working principle of water jet machining. 7M  
b) Mention the advantages and applications of abrasive jet machining. 7M
  
- 4. Explain the principle, working and advantages of electro chemical machining process. 14M
  
- 5. a) Discuss the advantages of EDM as compared to other non traditional methods with regard to
  - (i) meal removal rate
  - (ii) surface finish and
  - (iii) accuracy8M  
b) Discuss the properties required for a dielectric fluid to be used in the EDM process. 6M
  
- 6. a) What is laser and how is it used to machine the materials? Give the thermal features and analysis of the laser beam machining 8M  
b) Discuss the process capabilities and limitations of electron beam machining. 6M
  
- 7. a) Explain in detail various industrial applications of plasma machining. 6M  
b) What is the principle involved in chemical machining? Explain with suitable sketches. 8M
  
- 8. What is Rapid prototyping? Explain the process of Stereo lithography for manufacturing prototypes. 14M

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