IV B.Tech. I Semester Regular & Supplementary Examinations Nov/Dec 2015
Operations Research
(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   Solve the following LPP by the principle of Duality:

Minimize: $z = 6x_1 + 3x_2$

Subject to: $6x_1 - 3x_2 + x_3 \quad 2$

$3x_1 + 4x_2 + x_3 \quad 5$

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

2. a) What is meant by Travelling salesman problem?   4M

b) Find the optimal assignment schedule for the assignment of jobs to machines, given that the elements in the matrix represent costs in hundreds of Rupees:

		MACHINES		
		A	B	C
JOBS	1	15	10	9
	2	9	15	10
	3	10	12	8

10M

3.   A decision has to be made for group replacement versus individual replacement policy for 500 electric bulbs of a particular make in a university campus. The cost of replacing an individual bulb is Rs.55/- and when replaced as group it is Rs.35/-. Find out an optimal replacement schedule. Failure rate for the bulbs were recorded as follows:

Month	1	2	3	4	5	6
Prob. Of failure	0.11	0.30	0.25	0.20	0.09	0.05

14M

4. a) What do you mean by

(i) two person-zero sum game

(ii) pay-off matrix?   4M

b) Solve the following game by graphical method:

|	B1	B2
A1	50	80
A2	60	50
A3	50	70

10M

5. a) What is meant by balking, jockeying and reneging in queuing theory?   6M

b) Patients arrive at a clinic according to a Poisson distribution at the rate of 20 patients per hour. The waiting room does not accommodate more than 14 patients. Examination time per patient is exponential, with a mean of 8 minutes.

(i) What is the probability that an arriving patient will not wait?

(ii) What is the probability that an arriving patient will find a vacant seat in room?

(iii) What is the expected waiting time until a patient leaves the clinic?   8M

6. a) Define Lead time and Reorder level   4M

   b) Find the optimal order quantity for a product for which the price-breaks are as follows:

Quantity (units)	Unit cost (Rs.)
Below 100	200
101 to 200	180
Above 200	160

   The monthly demand to the product is 400 units. The storage cost is 20% per year of price of product per unit. Ordering cost is Rs.50/order.   10M

7. a) State Bellman's principle of Optimality.   4M

   b) Find the shortest highway route between cities 1 and 7, shown in the road network, by DP backward recursive approach.

                                                                                                          10M
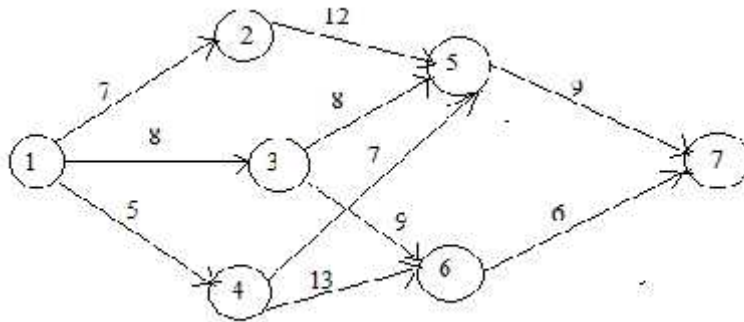
8. a) What are the phases of Simulation?   7M

   b) How do you apply simulation technique to an Inventory problem?   7M

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Code : 1G572

R-11

IV B.Tech. I Semester Regular & Supplementary Examinations Nov/Dec 2015
Automobile Engineering
(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)	Describe the construction and operation of real wheel drive.	10M
	b)	Write the significance of supercharging.	04M
2.		What are the requirements of fuel injection systems? Describe the individual pump fuel injection system with a suitable sketch.	14M
3.	a)	Name the different methods of engine cooling. Explain in detail the air cooling method.	07M
	b)	Explain with neat sketch the construction and working of a spark plug.	07M
4.	a)	Discuss about the national and international pollution standards.	07M
	b)	Discuss the merits and demerits of hydrogen and LPG as alternate fuels for IC engines.	07M
5.	a)	Explain the working of current – voltage regulator.	07M
	b)	Describe the requirements of automobile headlights and explain how they have been met with modern designs of head lights.	07M
6.		Describe the principle of a torque converter. Also discuss its advantages and disadvantages.	14M
7.	a)	Explain the terms: Camber, Caster, Steering axis inclination and Toe-in	10M
	b)	Compare the power steering with manual steering system.	04M
8.	a)	What is independent suspension? Describe any one front wheel independent suspension system.	10M
	b)	Compare mechanical and hydraulic braking systems.	04M

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Code : 1G576

IV B.Tech. I Semester Regular & Supplementary Examinations Nov/Dec 2015

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)	Classify different types of manufacturing systems.	7M
	b)	Explain the term "manufacturing strategies".	7M
2.	a)	What are the similarities in group technology and cellular manufacturing?	7M
	b)	Write short note on JIT manufacturing,	7M
3.	a)	Explain the evolution policies from MRP to MRP-II	7M
	b)	What are the components of DBMS? Explain any two of them.	7M
4.	a)	What are the different types of CMM construction? Explain any three with neat sketches.	7M
	b)	What are the elements of CAPP? Explain.	7M
5.	a)	What are the functions performed by FMS computer controlled system?	7M
	b)	What are the advantages of FMS in manufacturing?	7M
6.	a)	Differentiate between CNC and DNC machines.	7M
	b)	Explain the communication system between DNC machines and machine tools.	7M
7.	a)	What is role of automatic storage and retrieval systems in FMS?	7M
	b)	How AGVs are useful in FMS?	7M
8.	a)	What is knowledge base system? Explain in detail.	7M
	b)	Explain how Machine vision systems are useful in FMS?	7M

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Code : 1G574

R-11

IV B.Tech. I Semester Regular & Supplementary Examinations Nov/Dec 2015

Automation and Robotics

(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) Explain about various reasons for automation. Describe in detail about various strategies of automation.   8M

    b) Describe about various elements of automation   6M

2. a) What are the objectives of use of flow line automation?   4M

    b) Describe with neat sketches about configurations of automated flow line.   10M

3. a) Describe about various ways of improving line balance.   7M

    b) Explain about various elements of the parts delivery system.   7M

4.   Sketch and explain the four basic robot configurations classified according to the coordinate system.   14M

5. a) With an example differentiate forward and inverse kinematics.   7M

    b) Write down about Jacobians differential transformation   7M

6.   Explain about Robot Programming Languages in detail   14M

7.   Explain the various drive system used with an industrial robot and compare their features, merits and demerits.   14M

8.   Explain the importance of robots in

        a) Spray painting

        b) Assembly   14M

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IV B.Tech. I Semester Regular & Supplementary Examinations Nov/Dec 2015
Finite Element Methods
(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) Explain Stress- strain relations and develop the Strain Displacement (D) matrix for plane stress and plane strain conditions.   7M

   b) If a displacement field is described as follows, u = ($-x^2 + 3y^2 + 7xy$) 10^{-4} and v = ($2x + 4y - 2y^2$) 10^{-4}, determine the 3 planar stresses and strains at the point x=0, y=1. Assume E = 2 x 10^5 N/mm^2, = 0.3.   7M

2. Determine the
   a. Nodal deflections
   b. Stresses in each member
   c. Reactions at the supports, For the member shown in the Fig.1 Given that, $E_1 = 2 X 10^5$ Mpa, $E_2 = 1X10^5$ MPa and P = 1000 N
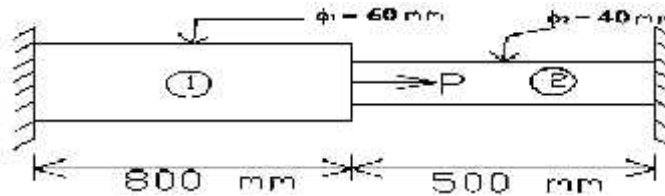
Fig.1   14M

3. The plane truss shown in Figure 2 is composed of members having a square 15 mm × 15 mm cross section and modulus of elasticity *E* = 69 GPa. Find
   a. Assemble the global stiffness matrix.
   b. Compute the nodal displacements in the global coordinate system for the loads shown.
   c. Compute the axial stress in each element.

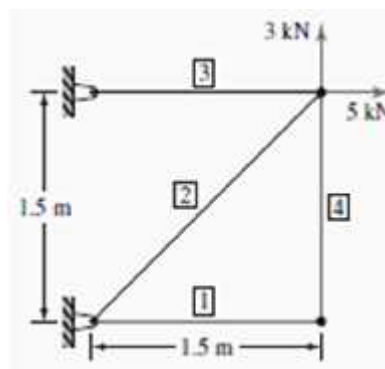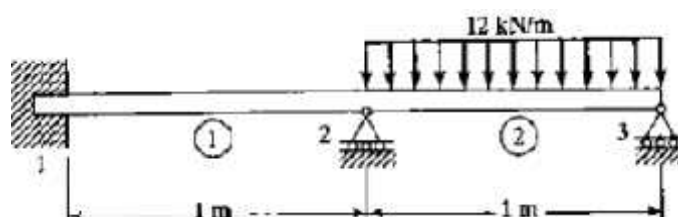Fig. 2   14M

4. For the beam and loading shown in the Fig.3. Determine the slopes at nodes 2, 3 and vertical deflection at the mod point of the distributed load. E = 200GPa and I=4X10^6 mm^4

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 = 70x10^3 MPa, μ = 0.3
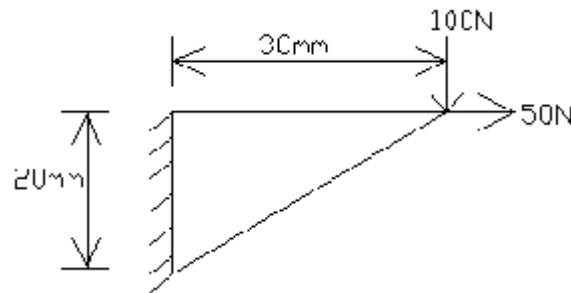

Fig. 4   14M

6. Consider a rectangular element as shown in the Fig. 5. Assume plane stress condition, E = 200x10^3 MPa, μ = 0.3 and q = [0, 0, 0.2, 0, 0.15, 0.10, 0, 0.05]^T. Evaluate J (Jacobian matrix), B (Strain displacement matrix) and (Stress) at = 0 and = 0.

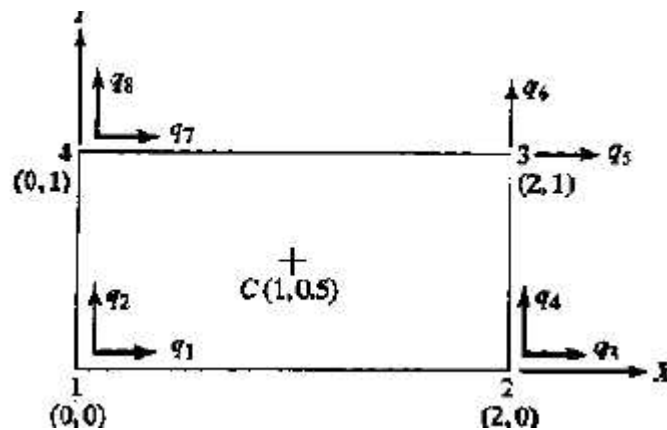Fig. 5   14M

7. A long cylinder of inside diameter 80mm and outside diameter 120mm fits in a hole over its full length. The cylinder is then subjected to an internal pressure of 2 MPa. Using two elements on the 10mm length, Find the displacements at the inner radius. E = 200 GPa and μ = 0.3   14M

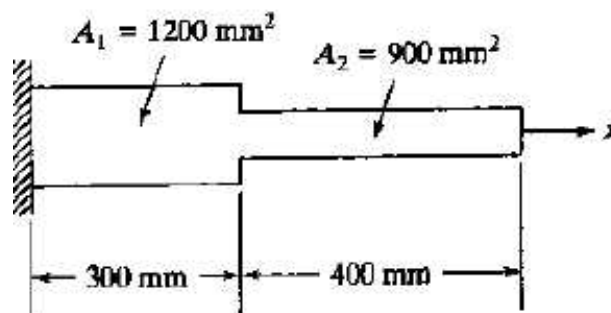8. Determine the Eigen values and Eigen vectors for the stepped bar shown in the Fig.6.Take E = 200GPa, = 7840kg/m^3

Fig. 6   14M

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Code : 1G578

R-11

IV B.Tech. I Semester Regular & Supplementary Examinations Nov/Dec 2015

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) Describe in detail the various aspects that are to be considered before selecting the modern machining process to be employed. 7M

   b) How do you classify the unconventional machining methods based on various criteria like type of energy, mechanism of metal removal, transfer media and energy source? 7M

2. a) Define ultrasonic and describe the process in which these are used to machine the material. 7M

   b) Sketch and describe any two types of tool feed systems used in ultrasonic machining. 7M

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. a) With the help of a neat diagram explain the electrolytic grinding process. 7M

   b) Discuss various advantages, applications and limitations of ECM process. 7M

5. a) Explain the working principle of electro discharge machining process with the help of a neat diagram. 8M

   b) With the help of a neat diagram, explain the electrode feed control in 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) Discuss the factors that influence the quality of the cut in plasma arc machining. 6M

   b) What are the specific advantages of using chemical machining over electrochemical machining? Give some practical applications of the chemical machining process. 8M

8. a) With the help of a neat sketch discuss the Stereo lithography process. 6M

   b) With the help of a neat diagram explain the working principle of abrasive flow machining process. 8M

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