Hall Ticket Number :										

R-11/R-13

Code: 1G571

IV B.Tech. I Semester Regular & Supplementary Examinations Nov 2016

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. A company that operates 10 hours a day manufactures each of two products on three sequential processes. Determine the optimal product mix. The following table summarizes the data of the problem:

Product	Minutes per minute			Unit Profit (Rs.)
	Process 1	Process 2	Process 3	
1	10	6	8	20
2	5	20	10	30

14M

2. DP auto has three plants in Bangalore, Hyderabad and Chennai, and two major distribution centers in Nagpur and Vizag. The capacities of the three plants during the next quarter are 1000, 1500, and 1200 cars. The quarterly demand at the two distribution centers are 2300 and 1400 cars. The transportation cost per car (in Rupees) on different routes between the plants and the distribution centers are given below. Design an optimum transportation schedule.

	Vizag	Nagpur
Bangalore	80	215
Hyderabad	100	108
Chennai	102	68

14M

3. Solve by B&B algorithm:

Minimize: $z = 5x_1 + 4x_2$

Subject to: $3x_1 + 2x_2 \geq 5$

$2x_1 + 3x_2 \geq 7$

$x_1, x_2 \geq 0$ and integer 14M

4. a) Define Saddle point and minimax criterion 4M

b) Solve the following game:

	B1	B2	B3
A1	3	6	1
A2	5	2	3
A3	4	2	-5

10M

5. a) Give a classification of queuing models with examples 4M

   b) Workers come to a tool store room to enquire about the special tools required by them. The average time between the arrivals is 60 seconds and the arrivals are distributed in Poisson fashion. The average service time is 40 seconds. Determine

      (i) Average queue length

      (ii) Average length of non-empty queue.

      (iii) Average number of workers in the system including the workers being attended

      (iv) Mean waiting time of an arrival

      (v) Average waiting time of an arrival (workers) who waits 10M

6. a) Derive an expression for basic deterministic EOQ model. 7M

   b) McBurger orders ground meat at the start of each week to cover the week's demand of 300 kg. The fixed cost per order is Rs.20. It costs about Rs.0.03 per kg per day to refrigerate the meat. Determine the optimum inventory level and optimum inventory cost/week of the policy. 7M

7. Solve by DP the following LPP:

   Maximize: $z = 4x_1 + 14x_2$

   Subject to: $2x_1 + 7x_2 \leq 21$

   $7x_1 + 2x_2 \leq 21$

   $x_1, x_2 \geq 0$ 14M

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

   b) What are the advantages and disadvantages of Simulation languages? 7M

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Hall Ticket Number :										

R-11 / R13

Code: 1G572

IV B.Tech. I Semester Regular & Supplementary Examinations Nov 2016

Automobile Engineering

(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) With a simple sketch explain how power is transmitted from engine to wheels in a four wheeler automobile. 10M
   b) Discuss about 'crank case ventilation'. 4M

2. With the help of neat sketch explain the working of mechanical fuel pump and compare the same with electrical fuel pump. 14M

3. a) Describe with a neat diagram the working of magneto coil ignition system. 10M
   b) Write the functions of anti-freeze solutions and thermostats in radiators. 4M

4. Explain the various pollution control techniques employed for reducing diesel engine emissions. 14M

5. a) Describe the lighting systems provided in four wheeler automobiles. 7M
   b) Explain the working of standard Bendix drive. 7M

6. a) Name the different types of automobile clutches. 4M
   b) Explain the working of centrifugal clutch with the help of a simple sketch. 10M

7. a) Explain the terms: Camber and Castor 4M
   b) Discuss the working of Davis steering mechanism. 10M

8. Describe with neat diagrams the working of pneumatic and vacuum brake systems. 14M

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Hall Ticket Number :										

R-11 / R-13

Code: 1G573

IV B.Tech. I Semester Regular & Supplementary Examinations Nov 2016

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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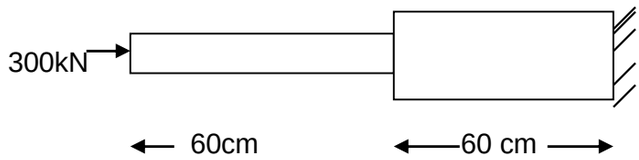
1. a) Write 3-D basic equations of elasticity and deduce the stress strain relation matrix for 3-D, 2-D and 1-D finite elements. 6M

   b) Differentiate among Galerkin principle, Rayleigh Ritz method and Weighted residual method of solving the engineering problems using finite element methods. 8M

2. a) Derive the shape functions for 1 D axial bar element with quadratic interpolation function. 4M

   b) A stepped bar is subjected to an axial load of 300 kN as shown in figure. Find the nodal displacements, element stresses and strains and reactions. Take E = 2 X 10^5 N/mm^2. The area of the bars are 300 mm^2 and 200 mm^2.



10M

3. a) Derive the stiffness matrix for the truss element by considering the temperature effects. 7M

   b) The coordinates of the plane truss element is given as 1(20,35) and 2(70,90) mm has the displacement values {-0.01 0.02 -0.01 -0.03}^{T} 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 mm^2. 7M

4. a) Differentiate between normal shape functions and Hermite shape functions and discuss the salient features of Hermite shape functions. 4M

   b) Estimate the deflection at the center and at a distance of 1.5 m from the end of the fixed beam of length 2 m loaded with uniformly distributed load of 100 kN/m. Take EI = 800 N-mm^2. And also calculate shear stress and bending moment at the centre. 10M

5. a) Why the three noded triangular element is called CST? Explain the strain displacement relation matrix for the CST. 7M

   b) For a plane strain problem, the nodal displacements are u_1 = 4.4 μm, u_2 = 2.2 μm, u_3=2.2 μm, v_1 = 3.8 μm, v_2 = 2.9 μm, v_3 = 4.5 μm. Take E=200 GPa, μ = 0.3 and t=10mm. Find the stresses, principal stresses. The coordinates of triangular element are 1(5,25), 2(15,5) and 3(25,15). All dimensions are in millimeters. 7M

6. a) What do you understand by isoparametric representation? How is it different from sub parametric and super parametric conditions? 5M

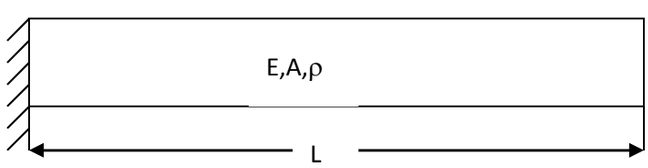
   b) Derive the Jacobian matrix for the 2-D quadrilateral element interms of natural coordinates. 9M

7. a) Derive the stress strain relation matrix for 2D axisymmetric element. 4M

   b) A large industrial furnace is supported on a long column of fire clay brick, which is 1 m X 1 m on a side .During steady state operation, installation is such that three surfaces of the column are maintained at 600 K , while the remaining surface is exposed to an air stream for which T_α = 300 K and h = 12 W/m^2 K . Determine the temperature distribution in the column and the heat rate to the air stream per unit length of column. Take K= 1 W/m K. 10M

8. a) How to solve the equilibrium equation by considering the dynamic terms in the formulation? Explain. 4M

   b) Evaluate the lowest Eigen value and the corresponding Eigen modes for the beam shown in the figure. E = 200 GPa and ρ = 7840 kg/m^3, I = 2000 mm^4, A = 240 mm^2, L =300 mm.



10M

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Hall Ticket Number :										

R-11/R-13

Code: 1G574

IV B.Tech. I Semester Regular & Supplementary Examinations Nov 2016

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. Outline a few salient points clearly distinguishing automation at the following levels:
   (i) Device level 5M
   (ii) Machine level 5M
   (iii) Cell level 4M
2. Briefly describe the following two cases of storage buffer effectiveness:
   (i) No buffer storage capacity at all 7M
   (ii) Infinite-capacity storage buffers 7M
3. a) Describe ANY ONE algorithm for line balancing. 12M
   b) State the advantage of a flexible assembly line. 2M
4. a) (i) Draw the SCARA and PUMA robot configurations and their corresponding work space. 5M
   (ii) Distinguish between the two configurations in terms of the geometry of the workspace, the application, and operational capabilities (e.g. tool velocity, acceleration and payload). 5M
   b) Write down ANY FOUR specifications of an industrial manipulator of your choice. Provide reasonable values for each of the specification. 4M
5. a) (i) What is meant by inverse kinematics? 2M
   (ii) With a schematic diagram of a two-link planar manipulator, illustrate that inverse kinematics results in multiple solutions. 3M
   b) Write down the relevant mathematical expressions that show the use of the Jacobian matrix of a manipulator to determine the following:
   (i) Tool velocities from the joint velocities 3M
   (ii) Joint torques from the forces acting on the end effector 3M
   (iii) The singular configurations 3M
6. A single-link robot with a rotary joint is motionless at $\theta = -5^0$. It is desired to move the joint in a smooth manner to $\theta = -80^0$ in 4 seconds. Find the coefficients of a cubic polynomial that accomplishes this motion and brings the arm to rest at the goal. Plot the position, velocity and acceleration of the joint as a function of time. 14M
7. a) (i) With a schematic diagram, describe the principle of operation of ANY ONE type of stepper motor. 6M
   (ii) What is need for micro-stepping and half-stepping? How are they achieved? 3M
   b) A certain potentiometer is to be used as the feedback device to indicate the position of the output link of a rotational joint. The excitation voltage of the potentiometer equals 7 V and the total wiper travel of the potentiometer is 300 degrees. The wiper arm is directly connected to the rotational joint so that a given rotation of the joint corresponds to an equal rotation of wiper arm. Determine the voltage constant of the potentiometer. 5M
8. a) Briefly describe the principle and application of robotic spray painting. 7M
   b) Illustrate the use of robot vision in the inspection of electronic printed-circuit boards. 7M

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Hall Ticket Number :										

R-11/R-13

Code: 1G576

IV B.Tech. I Semester Regular & Supplementary Examinations Nov 2016

Advanced Manufacturing Systems

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any* **five** questions

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

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1. a) Explain various types of manufacturing strategies. 8M
   b) Briefly explain the limitations of traditional manufacturing system 6M

2. a) Describe the methodology to be followed for developing a generative type of CAPP system 8M
   b) Explain Cellular Manufacturing in detail 6M

3. a) Briefly explain
      (i) Material Requirement Planning (MRP) and
      (ii) Manufacturing Resource Planning (MRP-II) 8M
   b) What is DBMS? State the advantages and disadvantages of DBMS 6M

4. a) Define CIM? Explain the elements of CIM 6M
   b) Briefly explain the techniques and applications of Simulation in Manufacturing 8M

5. a) What is FMS? State the advantages and disadvantages of FMS 8M
   b) Briefly explain the components of FMS 6M

6. a) How do DNC machines differ from CNC machines 6M
   b) Explain the role of computers in Automated Material Handling System 8M

7. a) What are the objectives of Automated Storage System 8M
   b) Differentiate AS/RS and Carousal Storage Systems 6M

8. a) Explain the role of Artificial Intelligence in FMS 8M
   b) What is Machine Vision? Briefly explain the process involved in Machine vision 6M

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Hall Ticket Number :										

R-11 / R13

Code: 1G578

IV B.Tech. I Semester Regular & Supplementary Examinations Nov 2016

Un Conventional 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 factors are to be considered while selecting a unconventional machining method? Explain the influence of those factors. 8M
   b) Give the complete classification of unconventional machining methods based on various factors. 6M

2. a) Explain the influence of process parameters on metal removal rate in ultrasonic machining. 7M
   b) List out the applications and limitations of ultrasonic machining. 7M

3. a) What practical problems are faced in water jet machining? How the problems are taken care? 7M
   b) Explain the influence of the characteristics of abrasive on the metal removal rate in abrasive jet machining. 7M

4. a) Explain the working principle of electro chemical machining. What reactions are taking place therein? 8M
   b) Comment about the surface finish and accuracy obtained in electro chemical machining. 6M

5. a) Explain how the electric pulses are controlled in electric discharge machining using an R-C circuit. 8M
   b) Comment about the selection of tool and dielectric material in electric discharge machining. 6M

6. a) With the help of line diagram explain the generation and control of electron beam. 7M
   b) Explain the applications and limitations of laser beam machining. 7M

7. a) Explain the mechanism of metal removal using plasma. 7M
   b) What factors are to be considered while selecting an etchant for chemical machining? 7M

8 a) With the help of line diagram explain the electro stream drilling process. 7M
   b) With the help of line diagram explain the selective laser sintering. 7M

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