Hall Ticket Number :										

R14

Code: 4PE521

M.Tech. II Semester Regular & Supplementary Examinations Aug/Sep 2016

Advanced Optimization Techniques

(Machine Design)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60Marks)

UNIT-I

1. Minimize $z = 3x_1 + 2.5x_2$

   Subject to the constraints:

   $2x_1 + 4x_2 \geq 40$

   $3x_1 + 2x_2 \geq 50$

   $x_1 \geq 0;\ x_2 \geq 0$ 12M

OR

2. The efficiency of 5 machines on each of 5 jobs is given below. Determine an assignment schedule of the jobs to the machines such that total efficiency is maximum

Machine/Job	1	2	3	4	5
I	62	78	50	101	82
II	70	85	60	75	55
III	88	96	118	85	71
IV	48	64	87	77	80
V	60	70	98	66	83

12M

UNIT-II

3. *Minimize* $f(x_1, x_2) = x_1^2 - 2x_1 + 1 + x_2^2$ *using steepest descentmethod.*

   Take starting point $(0,0)^T$ 12M

OR

4. Solve the following nonlinear programming problem using Lagrange multipliers method.

   Minimize $z = 3.6x_1 - 0.4x_1^2 + 1.6x_2 - 0.2x_2^2$

   Subject to:

   $2x_1 + x_2 = 10$

   $x_1, x_2 \geq 0$ 12M

UNIT-III

5. Explain Differences between genetic programming and genetic algorithms 12M

OR

6. Explain reproduction, crossover, mutation and termination criteria in genetic algorithms. 12M

UNIT-IV

7. Explain Non-dominated Sorted Genetic Algorithm (NSGA). 12M

OR

8. What is multi objective optimization? Explain Pareto's analysis. 12M

UNIT-V

9. Explain the steps to optimize welding parameters 12M

OR

10. Explain the steps to optimize the design of spur gear 12M

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Hall Ticket Number :										

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Code: 4PF521

M.Tech. II Semester Regular & Supplementary Examinations Aug/Sep 2016

Mechanical Vibrations

(Machine Design)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60Marks)

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UNIT-I

1. a) Derive the equation for logarithmic decrement for under damped system 5M

b) A vibrating system of mass 9 kg, spring stiffness 5.2 KN/m and a dashpot of Damping coefficient of 220 N/M/s determine

Damping factor

i) logarithmic decrement

ii) Ratio of two consecutive amplitudes

iii) Frequency of damped vibration 7M

OR

2. a) Explain forced vibrations and derive the response equation 6M

b) A system of beams supports a motor of mass 920 kg. The motor has an unbalanced mass of 1.15 kg located at 5.0 cm radius. It is known that the resonance occurs at 2000 RPM. The motor's operating speed is 1440 RPM. If damping factor is assumed to be less than 0.22 Determine (i)Amplitude of vibration(ii)The damping co-efficient (iii) Phase angle 6M

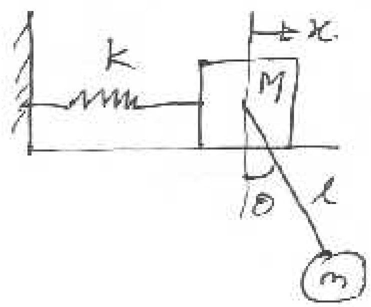
UNIT-II

3. a) Distinguish between vibrometer and accelerometer 3M

b) The time of free vibrations of mass hung from the end of a helical spring is 0.8 seconds. When the mass is stationary, the upper end is made to move upward with displacement of mm given by y= 18 Sin(2лt) . Neglecting the damping determine the vertical distance through which the mass is moved in the first 0.3 seconds

OR

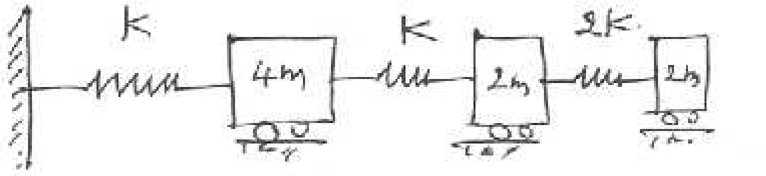
4. Determine the natural frequencies and mode shapes of the following system



12M

UNIT-III

5 Determine the influence coefficients of the following system



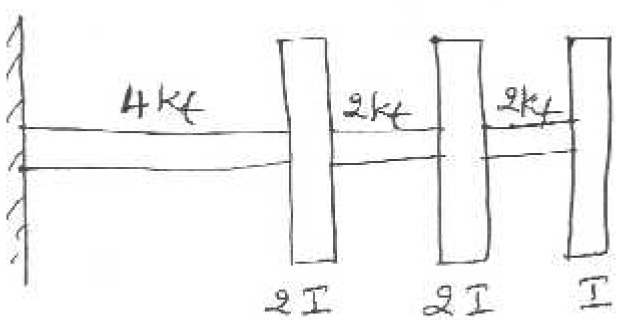
12M

OR

6. Explain the theory of eigen values and eigen vectors and how to find the eigen values and eigen vectors in detail 12M

UNIT-IV

7. Determine the natural frequency and its mode shape of the following system using stadola method



12M

OR

8. a) Explain torsional vibrations of two rotor system 6M

b) Explain torsional vibrations of three rotor system 6M

UNIT-V

9. Explain critical shaft with single rotor considering

i) Without damping

ii) With damping 12M

OR

10. Explain the following

i) Vibrations of strings

ii) Longitudinal vibrations of bars 12M

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Hall Ticket Number :										

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Code: 4PE522

M.Tech. II Semester Regular & Supplementary Examinations Aug/Sep 2016

Robotics

(Machine Design)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60Marks)

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UNIT-I

1. a) What are the components of a robotic system? Explain the functions of each of the components with a diagram. 8M
   b) Describe the classification and characteristics of mechanical grippers. 4M

OR

2. a) What are homogeneous transformations in robot kinematics? For a vector 20i + 25 j + 10k , perform a translation by a distance of 8 in x-direction, 8 in Y-direction and 0 in Z-direction. 8M
   b) Describe vacuum, magnetic and adhesive grippers. 4M

UNIT-II

3. Explain, with sketches, the DenavitHartenberg representation to describe the relationships between adjacent links of a robot. 12M

OR

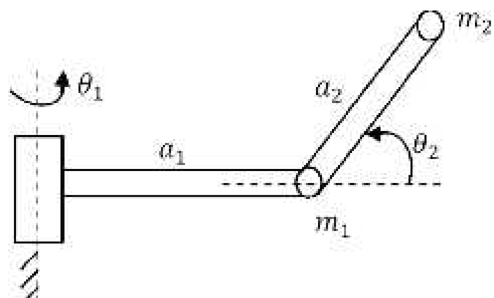
4. a) Explain forward and inverse kinematic equations for position and orientation. 8M
   b) Explain forward and reverse kinematics of robot for a Cartesian robot system 4M

UNIT-III

5. What is inverse Jacobian? How is it calculated? 12M

OR

6. Obtain the dynamic equations for the two-link manipulator shown in figure below. Assume that whole mass of the link can be considered as a point mass located at the outermost end of each link. The masses are m1 and m2 and the link lengths are a1 and a2.



UNIT-IV

7. a) Explain hydraulic devices with neat sketch. 6M
   b) Differences between pneumatic & hydraulic devices. 6M

OR

8. a) Explain joint space trajectory planning. 6M
   b) Explain third order polynomial trajectory planning. 6M

UNIT-V

9. a) Describe any four features of sensors. 8M
   b) Discuss any one device that can be used as velocity sensor in robot. 4M

OR

10. a) Explain LVDT with neat sketch. 8M
    b) Explain proximity and optical proximity sensors. 4M

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Hall Ticket Number :										

R14

Code: 4PF522

M.Tech. II Semester Regular & Supplementary Examinations Aug/Sep 2016

Mechanics of Composite Materials

(Machine Design)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60Marks)

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UNIT-I

1. How are composites classified? Briefly explain each type of composite and mention their applications. 12M

OR

2. a) What are the different types of matrix and reinforcement materials used in fiber reinforced composites? Explain. 8M
   b) Name the matrix and reinforcements used in metal matrix composites. 4M

UNIT-II

3. With the help of neat sketches, briefly explain the following processes for manufacturing of composites
   i) Hand lay-up technique
   ii) Filament Winding 12M

OR

4. a) Write the number of independent elastic constants for anisotropic, orthotropic, monoclinic, transversely isotropic and isotropic materials. 5M
   b) Find the relationship between the engineering constants and its compliance matrix for an orthotropic material. 7M

UNIT-III

5. Derive the expression for stiffness and compliance matrix for an angle ply lamina using generalized Hooke's law. 12M

OR

6. Briefly explain strength failure theories of an angle lamina. 12M

UNIT-IV

7. a) Derive four elastic moduli of a composite lamina using strength of materials approach. 7M
   b) A unidirectional glass/epoxy lamina with a fiber volume fraction of 70% is replaced by a graphite/epoxy lamina with the same longitudinal Young's modulus. Find the fiber volume fraction required in the graphite/epoxy lamina. Take E_{glass} = 85 GPa, $E_{graphite}$ = 230 GPa, E_{epoxy} = 3.4 GPa 5M

OR

8. a) Briefly explain Halpin-Tsai semi empirical models in the analysis of a composite lamina. 6M
   b) Explain the elasticity approach to determine four elastic moduli of a composite lamina. 6M

UNIT-V

9. Find the three stiffness matrices [A], [B] and [D] for a three-ply [0/30/–45] graphite/epoxy laminate using classical lamination theory. Take E_1 = 181 GPa, E_2 = 10.3 GPa, ν_{12} = 0.28, G_{12} = 7.17 GPa and assume each ply having thickness of 5 mm. 12M

OR

10. a) List various special cases of laminates and explain in detail symmetric, cross-ply and angle-ply laminates. 6M
    b) Explain the procedure for finding the successive loads between first ply failure and last ply failure of a laminate. 6M

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Hall Ticket Number : | | | | | | | | | | |

R14

Code: 4PF523

M.Tech. II Semester Regular & Supplementary Examinations Aug/Sep 2016

Theory of Plasticity

(Machine Design)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60Marks)

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UNIT-I

1. Explain Von Mises yield criteria. 12M

OR

2. The state of stress at a point is given by the following terms:

$\begin{bmatrix} 30 & -10 & 5 \\ -10 & 20 & 10 \\ 5 & 10 & 5 \end{bmatrix}$ N/mm2. Determine the normal and shear stresses on a plane whose direction cosines are: $0, \frac{\sqrt{3}}{2}, \frac{1}{2}$. 12M

UNIT-II

3. a) Explain Drucker stability postulate for an elastic material. 6M

   b) State and establish the uniqueness condition for an elastic solid. 6M

OR

4. Explain the flow rule associated with Tresca's yield function. 12M

UNIT-III

5. Explain the Prandtl-Reuss Material Model. 12M

OR

6. How the concept of effective stress and effective strain are used to define the work hardening rule? Explain. 12M

UNIT-IV

7. Explain bisection and modified Newton-Raphson methods for solving nonlinear equations. 12M

OR

8. Explain the steps involved in finite element model of plasticity. 12M

UNIT-V

9. Explain the boundary surface theory to account for the cyclic behavior of material under uniaxial loading. 12M

OR

10. State and explain the lower and upper bound theorems. 12M

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Hall Ticket Number :										

R14

Code: 4PF524

M.Tech. II Semester Regular & Supplementary Examinations Aug/Sep 2016

Design for Manufacturing

(Machine Design)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60Marks)

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UNIT-I

1. Briefly explain the following
   i) Creativity in design. Ii) Criteria for material selection 12M

OR

2. a) Write short notes on Selection of Materials for design Developments in Material technology. 6M
   b) What are the General design rules for manufacturability? 6M

UNIT-II

3. Give the overview of various machining process available with neat sketches and working principles? 12M

OR

4. Define and explain in detail about
   (i) Dimensional Tolerance
   (ii) Surface Roughness 12M

UNIT-III

5. Explain in detail Why Casting Process is an important manufacturing process than Machining and fabrication process. 12M

OR

6. List out product design rules for sand casting Process. How they impact on quality of castings? 12M

UNIT-IV

7. a) Write in brief about design of brazed joints 6M
   b) What are the factors to be considered in design of weldments? 6M

OR

8. a) What is the role of Flash in closed die forging? Also give at least two applications of closed die forging process. 6M
   b) How parting lines are forming in the forging operations? 6M

UNIT-V

9. a) What are the different design guidelines for plastic components? 6M
   b) What are the basic principles for punching and blanking operations? 6M

OR

10. a) What are the design guidelines for machining and joining of plastics? 6M
    b) How the creep behavior is occurring in plastics? 6M

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