Narasaraopeta Engineering College (Autonomous)
Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16MMD101

M.Tech - I Semester Regular Examinations, Dec - 2018

COMPUTATIONAL METHODS IN ENGINEERING

(MD)

Time: 3 hours **Max Marks: 60**

Answer any FIVE questions.
All questions carry EQUAL marks

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1. Determine the values of y at the Pivotal points of the interval (0,1), if y satisifies the boundary value problem $y^{(iv)} + 81y=81x^2$, $y(0)=y(1)=y^{11}(0)=y^{11}(1)=0$ take n=3 [12]

2. (a). Use shooting method , solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 10y = 0$ where $y(0) = 4,\ y'(0) = 1$ [6]

   (b). Use the Rayleigh-Ritz method to approximate the solution of

   $y'' = 3x + 1,\ y(0) = 0, y(1) = 0$, using a quadratic in x as the approximating function. [6]

3. Use Crank Nicolsen method to solve for the temperature distribution of a long, thin rod with a length of 10 cm and the following values: k = 0.49 cal/(s·cm·C), Δx = 2cm, and Δt = 0.1 s. At t = 0, the temperature of the rod is zero and the boundary conditions are fixed for all times at T(0) = 100 ^{0}C and T(10) =50^{0}C. Note that the rod is aluminum with C = 0.2174 cal / (g .^{0}C) and ρ =2.7 g/cm^3. Therefore, k = 0.49 / (2.7 ·0.2174) = 0.835 cm^2 / s and λ = 0.835(0.1)/(2)^2 = 0.020875. [12]

4. A Cube is 7 cm. along each edge. Two opposite faces are held at 100^0 , the other four faces are held at 0^0 . Find the interior temperatures at the nodes of a 1cm. network. Use A.D.I. method. [12]

5. Find the correlation coefficient for the following data and also fit a straight line to the given data . [12]

x :	1	2	3	4	5	6	7
y :	0.5	2.5	2.0	4.0	3.5	6.0	5.5

6. Using Simplex method solve the following LPP [12]

   Maximize f = 6 x + 8 y

   subject to

   5 x + 2 y ≤ 40
   6 x + 6 y ≤ 60
   2 x + 4 y ≤ 32
   x ≥ 0 , y ≥ 0 .

7. Fit a curve of the form $y = a\,x^{b}$ to the following data [12]

x :	0.1	0.2	0.4	0.6	0.9	1.3	1.5	1.7	1.8
y :	0.75	1.25	1.45	1.25	0.85	0.55	0.35	0.28	0.18

8. A banjo string is 80 cm long and weighs 1.0 gm. It is stretched with a tension of 40,000 g. At a point 20 cm from one end it is pulled 0.6 cm from the equilibrium position and then released. Find the displacements along the string as a function of time. Use $\Delta x = 10$ cm. How long does it take to complete one cycle of motion? From this, compute the frequency of the vibrations. [12]

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Narasaraopeta Engineering College (Autonomous)
Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16MMD102

M.Tech - I Semester Regular and Supplementary Examinations, Dec – 2018.

ADVANCED MECHANICS OF SOLIDS

(MD)

Time: 3 hours **Max Marks: 60**

Answer any FIVE questions.
All questions carry EQUAL marks

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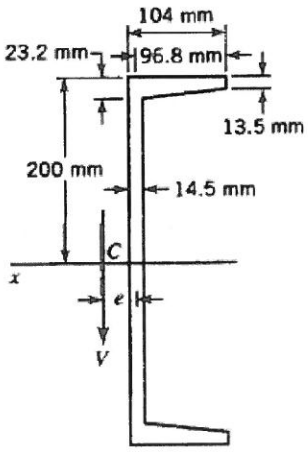
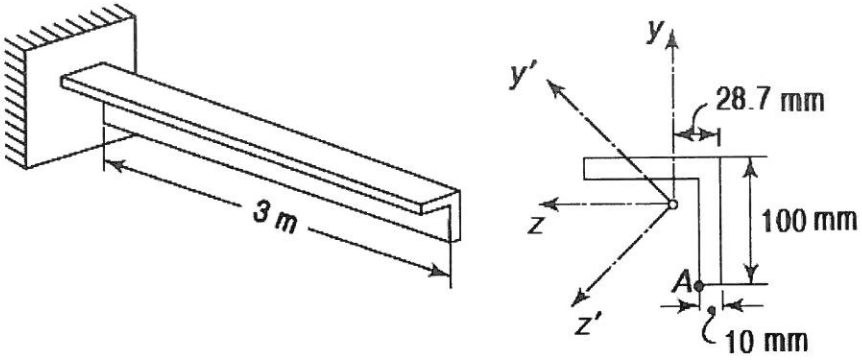
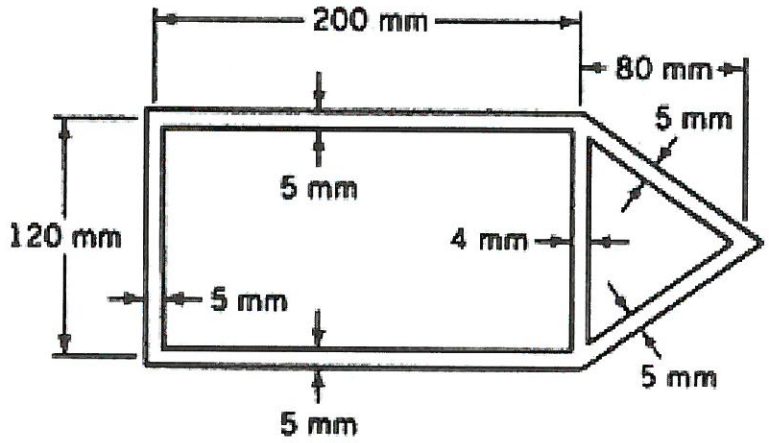
1. The known stress components at a point in a body, relative to the (x, y, z) axes are σ_{xx} = 20 MPa, σ_{yy} = 10 MPa, τ_{xy} = 30 MPa, τ_{xz} = –10 MPa and τ_{yz} = 80 MPa. Also, the second stress invariant is $I_2 = -7800\ (MPa)^2$. (a) Determine the stress component σ_{zz}. Then determine the stress invariants I_1 and I_3, and the three principal stresses, (b) Show that I_1, I_2 and I_3 are the same relative to (x, y, z) axes and relative to principal axes (1, 2, 3). [12]
2. (a) Derive differential equations of motion of a deformable body. [8]
   (b) State and explain the strain energy density of isotropic elastic materials. [4]
3. A rolled steel channel has the dimensions shown in figure. Locate the shear center for the cross section. [12]



4. (a) Differentiate between straight and curved beams. [4]
   (b) Derive Winkler-Bach formula for a curved beam from first principles. Also sketch stress distribution across the depth of the section. [8]
5. (a) Differentiate between symmentrical and unsymmetrical bending. [4]
   (b) A beam of equal-leg angle section, shown in figure, is subjected to its own weight. Determine the bending stress at point 'A' near the built-in section. It is given that the beam weighs 1.48 N/cm. The principal moments of inertia are 284 cm^4 and 74 cm^4. [8]



6. A solid disc of radius 150 mm is rotating at a speed of 2500 rpm. Determine the radial and hoop stresses in the disc if $\nu = 0.3$ & $\rho = 8000$ kg/m^3. If a hole of 2 cm is bored at the centre of the disc, then determine the stresses in the disc. Draw the stress distribution diagram. [12]
7. (a) Briefly explain Lame's equations applicable for thick walled cylindrical pressure vessels. [4]
   (b) A thick walled cylinder is subjected to an external pressure 9 MPa. Its internal and external radii are 60 mm and 90 mm respectively. Find the value of the internal pressure which can be applied if the maximum stress is not to exceed 30 MPa. Plot the variation of hoop and radial stresses developed in the material of the cylinder. [8]
8. The aluminum (G = 27.1GPa) hollow thin walled torsion member is shown in figure. Its length is 3 m. If the member is subjected torque of 11 kN-m, determine the maximum shear stress and angle of twist. [12]



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Narasaraopeta Engineering College (Autonomous)

Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: R16MMD103

M.Tech - I Semester Regular & Supplementary Examinations, Dec - 2018

ANALYSIS AND SYNTHESIS OF MECHANISMS

(MD)

Time: 3 hours **Max Marks: 60**

Answer any FIVE questions.
All questions carry EQUAL marks

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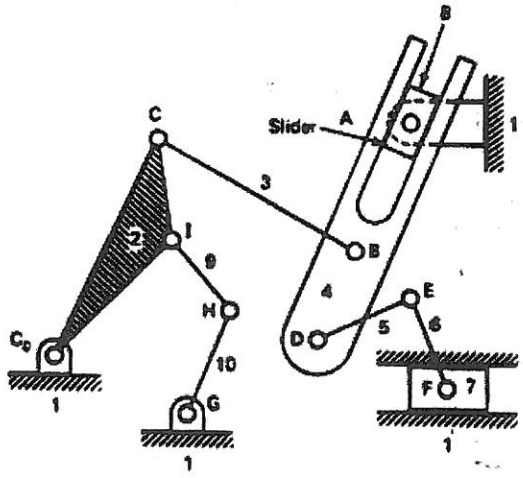
1. (a) Find the degrees of freedom of the following mechanism. 6M



(b) Discuss on acceleration analysis of inverted slider crank mechanism (any type). 6M

2. (a) Explain about fixed and moving centrodes with neat sketches. 6M
(b) Explain about inflection points and inflection circle with suitable sketches. 6M

3. (a) Derive type-I Euler- savery equation. 4M
(b)Synthesize a four bar linkage that will, in one of its positions, satisfy the following values for the angular velocities and accelerations:

$y = x^{1.2}$ $1 \le x \le 5$

Using Chebyshev spacing for three precision points, Take ϕ_0=30 degrees, ψ_0=60degrees and $\Delta\phi=\Delta\psi$=90degrees 8M

4. (a) Using graphical method explain motion generation for two prescribed positions of a 4-bar mechanism. 8M
(b) Explain in Brief about the following: 4M
(i) Bresse circle (ii) Return circle (iii) Cusp Points and (iv) Crunode points

5. Discuss on Synthesis of Four-bar Mechanisms for prescribed extreme values of the angular velocity of driven link. 12M

6. (a) Explain about Static equilibrium, also discuss on equilibrium of four force members. 8M
(b)What is meant by dynamically equivalent system? 4M

7. (a) Explain the dynamic force analysis of a four bar mechanism with a neat sketch. 6M
   (b) How to analyze inertia force and torque in reciprocating Engine analytically, Explain? 6M

8. (a) Explain the forward and inverse kinematics of Robotic manipulators. 8M
   (b) Explain D-H notations. 4M

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Narasaraopeta Engineering College (Autonomous)
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Subject Code: R16MMD104

M.Tech - I Semester Regular and Supplementary Examinations, Dec – 2018.

MECHANICAL VIBRATIONS

(MD)

Time: 3 hours **Max Marks: 60**

Answer any FIVE questions.
All questions carry EQUAL marks

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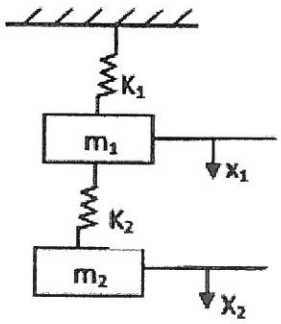
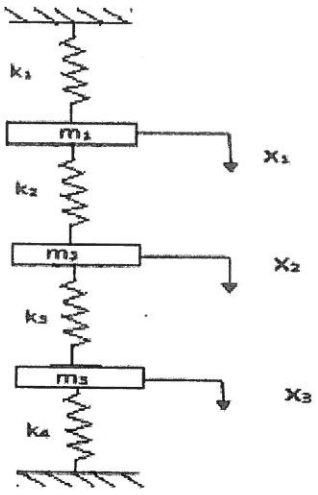
1. (a) Define the following terms? 4M
   i) Periodic motion
   ii) Fundamental mode of vibration
   iii) Degree of freedom
   iv) SHM (simple harmonic motion)
   b) Derive an expression for vibration response of a single degree of freedom system if the damping provided is under damped system. 8M

2. (a) Differentiate between free vibrations and forced vibrations? 4M
   (b) Find the normal modes of the system shown in figure below. Assume that $k_1 = k_2 = k$ and $m_1 = m_2 = m$ 8M



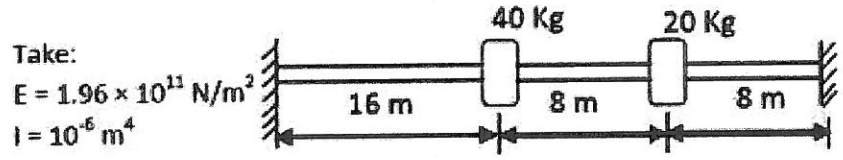
3. Determine the natural frequencies of the system shown in the Fig.2. Assume $m_1 = m_2 = m_3 = m$ and $k_1 = k_2 = k_3 = k_4 = k$ 12M



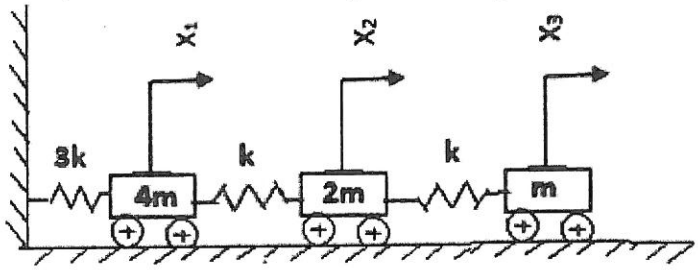
4. Write short on any three of the following: a) Damping ratio b) Undamped system (no damped) c) Under damped d) Critical damped e) Logarithmic decrement. 12M

5. Prove that the critical speed of whirling speed for a rotating shaft is same as the frequency of natural transverse vibration. 12M

6. Find the natural frequency of transverse vibrations for the system shown below by Rayleigh Method. 12M



7. Determine the natural frequencies and mode shapes of the system shown in figure below. 12M



8. a) What are the principles on which a Vibrometer and an accelerometer are based? Explain. 6M
   b) Discuss Seismic instrument with help of a sketch? 6M

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Subject Code: R16MMD108

M.Tech - I Semester Regular & SupplementaryExaminations, Dec- 18 /Jan - 19

DESIGN FOR MANUFACTURING

(MD)

Time: 3 hours **Max Marks: 60**

Answer any FIVE questions.
All questions carry EQUAL marks

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1. (a) What do you understand from the concept of design for manufacturing?
   (b) What are the general design principles for manufacturability? Explain.

2. (a) State and explain the general guidelines of design for machining.
   (b) Design for machining – ease –redesigning of components for machining ease with examples

3. (a) Discuss on design considerations for eliminating major casting effects.
   (b) How the material selection is influenced by the process selection?

4. (a) What are the various factors we need to consider in design of weldment?
   (b) Discuss on effect of thermal stresses at weld joints.

5. (a) What are the various design factors we need to consider for forging?
   (b) Explain the design principles for directional solidification.

6. (a) Explain the Visco elastic and creep behaviour in plastics-Various properties of plastics
   (b) What are the design considerations for injection moulding–Advantages and applications of injection moulding

7. (a) Describe the Systematic design for assembly methodology
   (b) Explain the layout design for automatic assembly.

8. (a) What are the precautions we need to consider while joining of plastics?
   (b) Write about selection dimensional tolerance and surface roughness in good design practice.

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Narasaraopeta Engineering College (Autonomous)
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Subject Code: R16MMD111

M.Tech - I Semester Regular and Supplementary Examinations, Dec – 2018.

MATERIAL TECHNOLOGY

(MD)

Time: 3 hours **Max Marks: 60**

Answer any FIVE questions.
All questions carry EQUAL marks

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1.	a)	Explain role of dislocations and bonds in solids.	4M
	b)	Explain theory of Hall-Petch strengthening mechanism and Give the mathematical relation with a neat curve?	6M
2.		What is particle strengthening? Differentiate particle strengthening and dispersion strengthening.	12 M
3.	a)	Differentiate dual phase steels and high strength low alloy steel.	6M
	b)	Differentiate Shape Memory alloys with Engineering Materials	6M
4.	a)	Name its different methods used for production of adhesives. Discuss any one method in detail with principle, advantages and applications.	8M
	b)	Write a short note on properties and applications of fibers.	4M
5.	a)	Which ceramic is produced in slip casting technique? What are the parameters that affect slip casting process?	7M
	b)	How can you produce CBN particles? list out properties of CBN particles.	5M
6.	a)	What are natural composites? What is the impact of natural composites on environment?	4M
	b)	Discuss the influence of shape, size, and particle distribution of ceramics on the properties of MMC's.	8M
7.	a)	Discuss briefly about solid solutions.	4M
	b)	Write a brief note on processing and applications of nano crystaline materials.	8M
8.	a)	Difference between adhesives and coatings.	6M
	b)	Write a short note on precipitate hardening and particle strengthening	6M