Hall Ticket Number :										

R14

Code: 4PEC14

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Computational Methods

(Common to Machine Design & Structural Engineering)

Max. Marks: 60 Time: 3 Hours

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

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UNIT-I

1. Solve the non-linear equations $x^2 + y^2 = 4$, $x^2 + y^2 = 16$ numerically with $x0 = y0 = 2.828$ using Newton-Raphson method perform two iterations. 12M

OR

2. Derive the formula for Simpson's $\frac{3}{8}$ rule and evaluate $\int_0^\infty e^{-x^2} dx$ by taking seven ordinates. 12M

UNIT-II

3. Explain Cubic Spline method to solve a boundary value problem. Use Cubic -Spline method to find $y(1.5)$ satisfying the differential equation $x^2y'' + xy' - y = 0$ with $y(1) = 1, y(2) = 0.5$. 12M

OR

4. Solve Laplace's equation with $h = \frac{1}{3}$ over the boundary of a square unit length with $u(x,y) = 9x^2y^2$ on the boundary. 12M

UNIT-III

5. Solve $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$ subject to the following conditions $u(0,t) = 0$, $u(1,t) = 0, t > 0$ and $\frac{\partial u}{\partial t}(x,0) = 0, u(x,0) = sin^3(\pi x)$ $for\ all\ 0 \le x \le 1.$ 12M

OR

6. Solve the boundary-value problem $u_t = 4u_{xx}$ subject to the conditions $u(0,t) = 0 = u(4,t), \frac{\partial u(x,0)}{\partial t} = 0, u(x,0) = 4x - x^2$ with $h = 1, k = 0.5$ 12M

UNIT-IV

7. Obtain the solution of the boundary-value problem defined by $\frac{d^2y}{dx^2} = -2$, $0 < x < 1; y(0) = 0, y'(1) = 0$ Taking two equal subintervals by using Galerkin-Technique. 12M

OR

8. Explain about the Applications to Two-Dimensional problems. 12M

UNIT-V

9. Write about 2D-plots and 3D-plots, input / output in MATLAB. 12M

OR

10. Write a MATLAB program to solve simultaneous system of linear equations numerically by Gauss -elimination method. 12M

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Hall Ticket Number :										

R14

Code: 4PF511

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Advanced Mechanisms

(Machine Design)

Max. Marks: 60 Time: 3 Hours

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

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UNIT-I

1. a) Discuss in detail about the mobility criterion for planer mechanisms and manipulators. 6M

   b) What is an inflection circle? Explain the application of inflection circle to kinematic analysis. 6M

OR

2. a) Explain Hartman's construction with an example 6M

   b) State any two forms of Euler-savary equation and discuss their significance. 6M

UNIT-II

3. a) Determine the Polode curvature in the four bar mechanism. 6M

   b) Write a short notes on Carter-Hall Circle. 6M

OR

4. a) State and derive hall's equation. 6M

   b) Explain Freudenstein's Collineation axis theorem. 6M

UNIT-III

5. Synthesi bar linkage usin eudenstein's equation to generate the function $y = x^{1.2}$ for the interval $1 \leq x \leq$ 5. The input crank is to start from θ_0=30° and is to have a range of $\Delta\theta$ = 90°. The output follower is to start at ϕ_0 = 60° and is to have a range of $\Delta\phi$= 90°. Use three precision points. 12M

OR

6. Using Bloch's method, synthesize and draw a four bar linkage to meet the following specifications of angular positions. Velocities and accelerations at one of its positions are

   ω_2 = 20 rad/sec , ω_3 = 8 rad/sec, $\omega_4 = 1^0$ rad/sec,

   α_2 = 0 rad/sec^2 , α_3 = 100 rad/sec^2 and α_4 = -150 rad/sec^2. 12M

UNIT-IV

7. a) Considering a four-bar linkage, explain how the body can be guided through two-distinct positions? 6M

   b) Explain overlay method for function generation. 6M

OR

8. a) Explain briefly the construction of Burmester's curve for guiding a body through four distinct positions. 6M

   b) Briefly explain Relative – Rotocenter method for function generation. 6M

UNIT-V

9. a) Explain D-H notations. Derive the 4x4 D-H – transformation matrix. 8

   b) Write short notes on link co-ordinate system for PUMA robot with neat sketch. 4

OR

10. a) Assign coordinate frames based on D-H representation for the SCARA robot. 6M

    b) Selecting the link parameter table, perform the inverse kinematic analysis of a spherical robotic manipulator 6M

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Hall Ticket Number :										

R14

Code: 4PF512

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Advanced Mechanics of Solids

(Machine Design)

Max. Marks: 60 Time: 3 Hours

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

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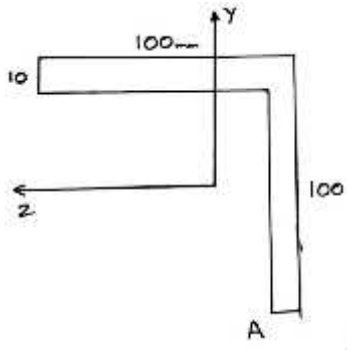
UNIT–I

1. Locate the shear center for a channel section

OR

2. A cantilever beam of equal leg angle section 100 x 100 x 10 mm is carrying a uniformly distributed load of 1000 N/m. If the span of the beam is 3 m, determine the stress at a point 'A' near the built-in-end. Also calculate the orientation of the neutral axis.

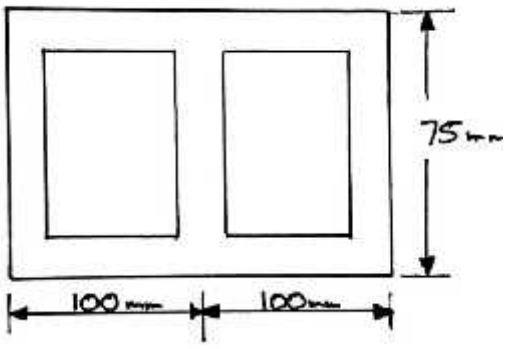


UNIT–II

3. What do you mean by curved beam? Explain in detail the difference between symmetrical and un-symmetrical bending.

OR

4. A steel box girder has the cross section shown in figure. The wall thickness is 10 mm. If the shear stress due to torque is limited to 100 p_a, determine
   i) Maximum permissible torque.
   ii) Twist per unit length.

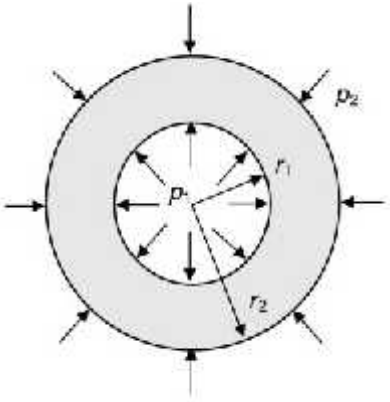


UNIT–III

5. Determine stress components in polar-coordinates for the following stress function.
$\varphi = \frac{p}{\pi} r\vartheta\cos\theta$

OR

6. Using polar co-ordinates express all boundary conditions for the figure shown



UNIT–IV

7. Derive the expression for pure bending of plates.

OR

8. Derive the expression for twist of circular shafts of constant cross section.

UNIT–V

9. Derive the expression for the stresses in rotating discs.

OR

10. Two carbon steel balls each 30 mm in diameter are pressed to gather by a force F. Find the maximum shear stress if F= 50N, E=207GP_a

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Hall Ticket Number :										

R14

Code: 4PF513

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Fracture Mechanics

(Machine Design)

Max. Marks: 60 Time: 3 Hours

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

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UNIT-I

1. a) What are the various types of fractures? 3M

   b) Explain effect of material properties on fracture 9M

OR

2. a) Describe the brittle fracture for notched and un-notched components 7M

   b) Describe time dependent crack growth and damage tolerance 5M

UNIT-II

3. a) Write a short notes on energy release rate 7M

   b) Determine energy release rate for double cantilever beam specimen 5M

OR

4. A plate of maraging steel has a tensile strength of 1900 MPa. Calculate the reduction in strength caused by a crack in this plate with a length $2a$ = 3 mm oriented normal to the tensile direction.

   Given: Young's modulus E = 200 GPa

   surface tension ge = 2 J/m2

   plastic energy per unit crack surface area gp = 2×104 J/m2

   critical stress intensity factor Kc = sc pa 12M

UNIT-III

5. a) Plot how the critical stress intensity Kc depends on the thickness and explain this 6M

   b) Explain why in case of short cracks or of very long cracks the linear elastic fracture criteria are no longer valid, even for relatively brittle materials. 6M

OR

6. a) Show that in the linear elastic regime the COD design curve predicts a maximum permissible crack length ($a$max) equal to half the critical crack length calculated with LEFM 6M

   b) Explain the under plane stress and strain condition fracture toughness 6M

UNIT-IV

7. a) Explain S-N curves 6M

   b) Describe the possible effects of a peak load on the crack growth behaviour during variable amplitude fatigue. 6M

OR

8. a) Describe the terms high cycle fatigue and low cycle fatigue 5M

   b) A long, 50 mm diameter rod is manufactured from a material of 700 MPa yield and 40 MPa√m toughness. The rod is circumferentially cracked, whilet tensioned by a force, P.

   What is the maximum safe load if the crack depth is 2 mm?

   If the load is 200 kN, what crack depth is tolerable? 7M

UNIT-V

9. a) Explain creep curve 6M

   b) Write a short notes on creep fatigue interactions 6M

OR

10. Discuss the creep rupture test and mention its importance in the design of materials for high temperature applications 12M

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Hall Ticket Number :										

R14

Code: 4PF514

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Materials Technology

(Machine Design)

Max. Marks: 60 Time: 3 Hours

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

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UNIT-I

1. Explain various strengthening mechanisms available for materials? 12M

OR

2. a) What are dislocations? How are they formed? 6M
   b) How do they affect the material properties? 6M

UNIT-II

3. a) What is meant by fiber and dispersion strengthening? 6M
   b) How is it achieved? 6M

OR

4. Discuss the various aspects of selection of materials? 12M

UNIT-III

5. What are TRIP steels? Give some examples? What are their applications? 12M

OR

6. What are micro alloyed steels? What are their properties? Where are they used? 12M

UNIT-IV

7. What are shape memory alloys? Give some examples and their properties. 12M

OR

8. What are the advantages of polymeric materials? List few of them with their molecular structure. 12M

UNIT-V

9. Explain the importance of advanced structural ceramics in any manufacturing industry. 12M

OR

10. How are composites processed? Explain at least three processing operations. 12M

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Hall Ticket Number :										

R14

Code: 4PF515

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Tribology

(Machine Design)

Max. Marks: 60 Time: 3 Hours

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

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UNIT–I

1. Write a short note on
   a) Thermal consideration in sliding contact
   b) Friction in extreme condition

OR

2. Explain the term
   a) Surface interaction
   b) Surface features

UNIT–II

3. Discuss the
   a) Laws of wear
   b) Suraface treatments

OR

4. Discuss the
   a) Wear of metals & Non metals.
   b) Laser Methods

UNIT–III

5. Define viscosity and explain briefly the properties of oils.

OR

6. Write a short note on
   a) Gas lubrication
   b) Magneto hydrodynamic lubrication

UNIT–IV

7. Write a short note on
   a) Long & short bearings
   b) Pad bearing & journal bearings

OR

8. a) What are the various types of flow restrictors in hydrostatic bearings?
   b) Write a short note on Hydrostatic lubrications of pad bearing.

UNIT–V

9. Explain the term
   a) Rolling contact of elastic solids
   b) Soft and hard Elasto Hydrodynamic Lubricants(EHL)

OR

10. Derive the Reynolds equation for elasto hydrodynamic journal bearing.

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