B.L.D.E Association"s

VACHANA PITAMAHA DR.P.G.HALAKATTI

COLLEGE OF ENGINEERING AND TECHNOLOGY ,VIJAYPUR

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QUESTION PAPERS

2nd SEMESTER

M.Tech MMD

DEC. 2018/JAN. 2019

INDEX

CBCS SCHEME

USN | | | | | | | | | | |

16/17MDE23

Second Semester M.Tech. Degree Examination, Dec.2018/Jan.2019
Dynamics and Mechanism Design

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

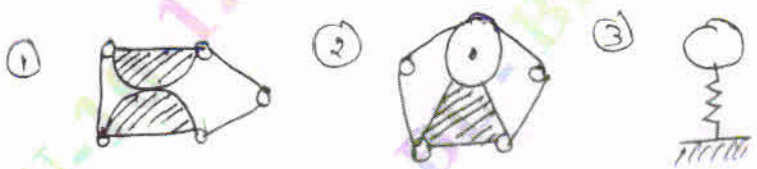
Module-1

1 a. Explain the Grashoff's law and inversions. **(08 Marks)**

b. Elaborate planar, spherical and spatial mechanisms. **(08 Marks)**

OR

2 a. What are equivalent linkages? Determine the equivalent linkages for following mechanisms:



(10 Marks)

b. Explain mechanical advantage and transmission angle. **(06 Marks)**

Module-2

3 a. Explain Holonomic and Non-holonomic constraints with examples. **(08 Marks)**

b. Describe the principle of virtual work and virtual displacement. **(08 Marks)**

OR

4 a. Derive Lagrangian equation from D Alembert's principle for a holonomic system. **(08 Marks)**

b. Using variation principle of the Hamilton, write the equation of motion for the mechanical system shown in Fig.Q4(b).

Fig.Q4(b) **(08 Marks)**

Module-3

5 a. Explain function generation, path generation and body guidance. **(08 Marks)**

b. Elaborate Chebyshev spacing and structural error. **(08 Marks)**

OR

6 a. Explain the synthesis of crank and rocker mechanism. **(08 Marks)**

b. The rocker of crank-rocker mechanism is to have length of 50 mm and swings through a total angle of 45° with TR = 1.25. Determine suitable set of dimensions. **(08 Marks)**

Module-4

7 a. Derive the couple curve for slider crank mechanism using analytical method. **(08 Marks)**

b. Synthesize the linkage to generate the function $y = \log x$ for $10 \leq x \leq 60$ using input range 120° and output range of 90° using four position synthesis. **(08 Marks)**

OR

8 a. Explain Bloch's method of synthesis. **(08 Marks)**

b. Synthesize the function generator using Freudenstien equation, $y = \sin x$ for $0° \leq x \leq 90°$. The range in ϕ is 120° and range in Ψ is 60° using Chebyshev spacing for precision points. **(08 Marks)**

Module-5

9 a. Explain Eulerian angles. **(10 Marks)**

b. What are spatial mechanisms? Mention some of the practical applications of spatial mechanisms. **(06 Marks)**

OR

10 Write short notes on:

a. Overlay method

b. Cognate linkages

c. Three position synthesis

d. Gyroscopic effect **(16 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | |

16/17MDE252

Second Semester M.Tech. Degree Examination, Dec.2018/Jan.2019
Theory of Plasticity

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing one full question from each module.***

Module-1

1 a. Explain the following : (i) Octahedral stresses (ii) Spherical and Deviatoric stresses. (iii) Stress invariants (iv) Any four idealized stress-strain diagrams. **(08 Marks)**

b. The stress Tensor at a point is given by,

$$\tau_{ij} = \begin{bmatrix} 40 & 40 & 120 \\ 40 & 80 & 80 \\ 120 & 80 & 120 \end{bmatrix} N/mm^2.$$

Calculate for the plane having directions cosines $a_{nx} = \frac{1}{\sqrt{6}}$, $a_{ny} = \frac{1}{\sqrt{3}}$, $a_{nz} = \frac{1}{\sqrt{2}}$ (i) Total stresses (ii) Normal stress (iii) Shear stress (iv) Shear stress directions **(08 Marks)**

OR

2 a. Explain strain rate and strain rate tensor. **(06 Marks)**

b. Explain finite strain coefficients. **(10 Marks)**

Module-2

3 a. Explain the experimental verification of yield criteria **(08 Marks)**

b. A thin wall tube of mean radius 100 mm and wall thickness 4 mm is subjected with torque of 10 N-m. If the yield strength of the tube material is 122.5 MPa. Determine the value of axial load 'P to be applied to the tube. So that the tube starts yielding according to the Misers Yield Criteria. **(08 Marks)**

OR

4 a. Explain yield surface for an isotropic perfectly plastic material with sketch. **(08 Marks)**

b. A state of stress at a point in a material is given by $\sigma_x = 80\,MPa$, $\sigma_y = 100\,MPa$, $\tau_{xy} = 60\,MPa$, (Y = 150 MPa). If yield strength of the material is 150 MPa. Determine weather yield of the material will occur or not according to the Tresca and Von-mises yield criteria. **(08 Marks)**

Module-3

5 a. State and explain lower and upper bound theorems. **(08 Marks)**

b. Explain and derive the plastic stress-strain relation of Prantlo-Reuss. **(08 Marks)**

OR

6 a. Explain the following: (i) Levy-Von-mises equations (ii) Concept of plastic potential. **(08 Marks)**

b. Explain stages of plastic yielding. **(08 Marks)**

Module-4

7 a. A rectangular beam 12 cm wide and 15 cm deep is 4 m long. It is simply supported at the ends and carries a concentrated load at the centre. This load is increased so that the outer 3 cm depth of beam yields plastically. The stress-strain curves for the beam material is given by $\sigma = 700\,\epsilon^{0.25}$. If the yield stress for the beam material is 250 MPa, plot the residual stress distribution in the beam. **(08 Marks)**

b. A strip of initial width 6.25 mm is drawn through tapered dies to a final width of 5.625 mm in a state of plane strain. Considering thickness to be equal to 10 mm, semi die angle 10°, coefficient of friction 0.03, determine the draw stress when (i) Back pull is zero (ii) Back pull is 150 N. Yield stress for strip material is 250 N/mm^2. **(08 Marks)**

OR

8 a. For a bar with non-linear stress-strain behavior derive the torsion equation in the form, $\frac{T}{J_n} = \frac{T'}{\gamma^n} = F\left(\frac{\theta}{l}\right)^n$. Neglecting the elastic shear strain. **(06 Marks)**

b. Explain briefly four different types of extrusion. **(04 Marks)**

c. A circular shaft of inner radius 4 cm and outer radius 10 cm is subjected to a twisting couple so that the outer 2 cm deep shell yields plastically. Determine the twisting couple applied to the shaft. Yield stress in shear for the shaft material is 145 N/mm^2. Also determine the couple for full yielding. **(06 Marks)**

Module-5

9 a. Derive the continuity equations for in compressible two dimensional flow considering slip lines. **(08 Marks)**

b. Name different methods of construction of slip lines and explain any one. **(04 Marks)**

c. Draw the flow chart of computational procedure for incremental theory of plasticity. **(04 Marks)**

OR

10 a. List the properties of the slip lines. **(06 Marks)**

b. State the Hencky's two theorems and prove any one. **(10 Marks)**

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