BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI

(MID SEMESTER EXAMINATION)

CLASS: BE **SEMESTER : VI**
BRANCH: PRODUCTION **SESSION : SP/17**

SUBJECT: PE6003-MATERIAL DEFORMATION PROCESSES

TIME: 1.5 HOURS **FULL MARKS: 25**

INSTRUCTIONS:

1. The total value of the questions are 30 marks.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtain exceed 25 marks. The excess will be ignored.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. The missing data, If any, may be assumed suitably.
6. Nothing should be written on front or back of the question paper except tick marking.

Q1. (a) Differentiate between Isoforming, Ausforming and Marforming. [2]
(b) Show the nature of forces in different deformation processes using suitable diagrams. [3]

Q2. (a) Find out the differential equilibrium conditions of stresses in 3 – Cartesian Co-ordinate system. [2]
(b) A state of stress is given by $\delta_x = 25\,p$ and $\delta_y = 5\,p$ plus shearing stress τxy. On plane at 45 ° counter clockwise to the plane on which δ_x acts, the state of stress is 50 MPa tension and 5 MPa shear. Determine the value of δ_x, δ_y and τxy. [3]

Q3. The state of stress a point is given by the following stress tensor. [5]

$$\delta ij = \begin{bmatrix} 10 & 1 & -8 \\ 1 & -6 & 6 \\ -8 & 6 & 20 \end{bmatrix}$$

Determine (i) Stress Invariants
(ii)Principal stresses
(iii) Maximum Principal shearing stress.

Q4. (a) Define volume strain and show that the volume strain $\Delta = \varepsilon_x + \varepsilon_y + \varepsilon_2$. [2]
(b) Determine the volume of 10 cm copper sphere that is subjected to a fluid pressure of 12 MPa. Given Elastic constant for copper E = 110 GPa, G = 41.4 GPa. [3]

Q5. (a) Find out the condition for plastic instability [2]
(b) What load is required to deform a cube of 80 mm side if constraining forces on its sides are 160 ton. Yield stress of the cube material could be taken as 60 ton/cm^2. [3]

Q6. (a) Establish relation ship between the following [2]
(i) Engg strain and True strain
(ii) Engg stress and True stress
(b) The state of strain at a given point in a body is follows:- [3]

$$\varepsilon ij = \begin{bmatrix} -0.005 & -0.004 & 0 \\ -0.004 & .001 & 0 \\ 0 & 0 & 0.001 \end{bmatrix}$$

Determine (i) Strain Invariants
(ii)Principal strain
(iii) Maximum principal shearing strains.

*******28.02.17*****M**