

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION SP/2023)

CLASS: B. TECH  
BRANCH: PRODUCTION ENGINEERING

SEMESTER : VI  
SESSION : SP/2023

SUBJECT: PE319 MATERIAL DEFORMATION PROCESSES

TIME: 02 Hours

FULL MARKS: 25

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

-----

		CO	BL
Q.1(a)	With neat sketch draw the state of stress at deformation zone for bulk forming processes?	[2]	1 2
Q.1(b)	Discuss the emerging forming process which is a combination of conventional forging and casting process?	[3]	4 2
Q.2(a)	State the dies used in hydrodynamic wire drawing along with its characteristics?	[2]	2 2
Q.2(b)	What are the roles of water and advantages of hydro-forming process? Elaborate the steps of tube hydro-forming process.	[3]	3 2
Q.3(a)	Derive the equations of motion for a solid body under static equilibrium.	[3]	2 3
Q.3(b)	State the conditions for which the equations of motion are reduced to the equilibrium equations	[2]	2 2
Q.4(a)	Define uniform strain. Prove that if a strain-hardening metal obeys Hollomon true stress-strain relation, then uniform strain equals to the strain hardening exponent ( $n$ )	[2]	2 3
Q.4(b)	The state of stress at a point given by the stress tensor is $\begin{bmatrix} 10 & 6 & 5 \\ 6 & 12 & 8 \\ 5 & 8 & 6 \end{bmatrix}$	[3]	2 4
	Calculate the normal and shear stress components on a plane having direction cosines $1/\sqrt{2}, 1/\sqrt{2}$ and 0		
Q.5(a)	Derive the relationship between engineering stress and true stress.	[2]	2 3
Q.5(b)	The displacement $u_1, u_2$ and $u_3$ are given as: $u_1 = (2x_1^2 + 6x_1 + 9x_2^3) \times 10^{-6}$ m, $u_2 = (9/x_1 + 5x_2 + 2x_1^2x_2) \times 10^{-6}$ m and $u_3 = 0$ , Evaluate the strains $\epsilon_{11}, \epsilon_{22}$ and $\gamma_{12}$ at the point (5,3)?	[3]	2 4

.....24/02/2023.....M