

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)**

**CLASS: BTech  
BRANCH: PIE**

**SEMESTER : V  
SESSION : MO/2023**

**SUBJECT: PE319 MATERIAL DEFORMATION PROCESSES**

**TIME: 3 Hours**

**FULL MARKS: 50**

**INSTRUCTIONS:**

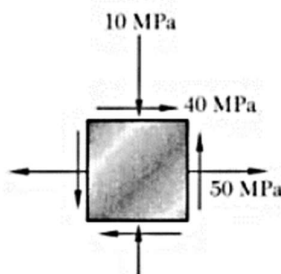
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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|--|-------|----|
| Q.1(a) Explain the following forming techniques (i) Isothermal forming (ii) Hydro tube forming.                                | [5] 1 | 2  |
| Q.1(b) With Neat sketch explain the procedure of emerging metal forming process which is a combination of forging and casting? | [5] 1 | 2  |

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|---|-------|---|
| Q.2(a) For the following state of stress, find the principal and critical values? | [5] 2 | 3 |
|---|-------|---|

$$\sigma_{ij} = \begin{bmatrix} 120 & 50 & 0 \\ 50 & 80 & 0 \\ 0 & 0 & 0 \end{bmatrix} MPa$$

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|---|-------|---|
| Q.2(b) For the state of plane stress shown, determine (a) the principal panes, (b) the principal stresses, (c) the maximum shearing stress and the corresponding normal stress. | [5] 2 | 3 |
|---|-------|---|



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|---|-------|---|
| Q.3(a) Discuss the different lubrication regime with their advantages and disadvantages?  | [5] 3 | 2 |
| Q.3(b) Briefly explain the role of Lubricants in the material deformation process. What are the factors required in selecting a Lubricant for material deformation process? | [5] 3 | 2 |
| Q.4(a) Briefly discuss the various numerical methods to derive the material deformation processes?  | [5] 4 | 3 |
| Q.4(b) Formulate the equation for mean die pressure in open die forging of strip that obeys coulombs friction law?  | [5] 4 | 4 |
| Q.5(a) Describe the dependence of the extrusion pressure/ force with respect to ram travel and die angle with suitable graphs.  | [5] 5 | 2 |
| Q.5(b) With neat sketch show the stresses induced in the wide-strip drawing. Also write the expression for draw stress?   | [5] 5 | 2 |