

GANPAT UNIVERSITY
M. TECH SEM- I (CAD/CAM) REGULAR EXAMINATION- JAN-2014
3ME112: ADVANCED METAL FORMING & MACHINING PROCESSES

MAX. TIME: 3 HRS

MAX. MARKS: 60

- Instructions:** (1) This Question paper has two sections. Attempt each section in separate answer book.
 (2) Figures on right indicate marks.
 (3) Be precise and to the point in answering the descriptive questions.

Section: I

Q.1 Answer the following: [10]

[A] Explain the various theories of plastic flow and give their limitations. (5)

[B] The stress at a point is given by (5)

$$\begin{bmatrix} 0 & -150 & 0 \\ -150 & 200 & 0 \\ 0 & 0 & -250 \end{bmatrix}$$

Determine the principal stresses and maximum shear stress. Also Determine the orientation of any one of principal stress.

OR

Q.1 Answer the following: [10]

[A] Differentiate between cold, hot and warm working of metals. Give the advantages and limitations of these methods. (5)

[B] Explain the strain hardening phenomenon. What is the effect of strain hardening on plastic deformation? (5)

Q.2 Answer the following: [10]

[A] Derive an expression for average pressure during strip forging. (5)

[B] Calculate the rolling load if steel is hot rolled 25 percent from a 40 mm thickness slab using a 900 mm diameter roll. The slab is 750 mm wide. Assume $\mu=0.25$. The plain strain flow stress is 160 MPa at entrance and 210 MPa at the exit from the roll gap due to increasing velocity. What would be the rolling load if sticking friction occurs? (5)

OR

Q.2 Answer the following: [10]

[A] A block of lead 50 x 50 x 300 mm is pressed between flat dies to a size 25 x 100 x 300 mm. if the uniaxial flow stress is 7.5 MPa and $\mu=0.21$. Determine the max. pressure and average pressure. Also calculate total forging load. (5)

[B] Derive an expression for the pressure distribution in rolling strip in plain strain. (5)

Q.3 Answer the following:(Any Two) [10]

[A] Explain the state of stress acting in wire drawing process. Also derive an expression for draw stress for wire drawing. (5)

[B] What do you mean by High energy rate forming? Explain electromagnetic forming with neat sketch. (5)

[C] Explain slipline field theory criteria for metal working operation. (5)

Section: II

- Q.4 Answer the following: [10]**
- [A]** With suitable assumption derive the condition for material removal rate for brittle material machined by ultrasonic machining. Material removal rate can be express as: (5)
 $5.9 R^{1/2} Y_0^{1/2} (\sigma/H) f$ (mm/second).
Where R = Radius of grit, σ = Stress, H = Hardness, f = Frequency, Y_0 : Amplitude of vibration.
- [B]** What is meant by machinability? Explain the method of representing the machinability. (5)
- OR**
- Q.4 Answer the following: [10]**
- [A]** Define Electrical Discharge Machining? Briefly explain the process principle of singled is charge condition using neat sketch and effect of process parameters on surface finish for Electrical Discharge Machining. (5)
- [B]** How do you define tool life? Explain the parameters that control the tool life of a single point cutting tool in detail. (5)
- Q.5 Answer the following: [10]**
- [A]** Explain laser beam machining process with neat sketch and characterize the process by its merits and demerits. (5)
- [B]** Draw the schematic diagram and discuss the role of subsystems used in water jet machining. (5)
- OR**
- Q.5 Answer the following: [10]**
- [A]** Explain electron beam machining process with neat sketch and characterize the process by its merits and demerits. (5)
- [B]** Discuss the various phases of material removal mechanism in electrochemical grinding with neat sketch. (5)
- Q.6 Answer the following: (Any Two) [10]**
- [A]** With suitable example enlist the necessities that contribute to the development of non-conventional machining process and classify them. (5)
- [B]** Schematically explain cryogenic machining process. (5)
- [C]** Draw schematic diagram of Abrasive Jet Machining and derive the equation for Material Removal Rate for ductile and brittle materials in an Abrasive Jet Machining. (5)

End of Paper