Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(MTI)/SEM-1/MTI-101/2009-10

2009

MATERIAL PROCESSING TECHNOLOGY

Time Allotted : 3 Hours | Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *seven* questions. $7 \times 10 = 70$

1. Explain the following terms : $4 \times 2\frac{1}{2}$

   a) Modules of elasticity

   b) Tangent modulus

   c) Secant modulus

   d) Proof stress.

2. The following results were obtained during the tensile testing of a heat treated alloy steel :

Force (kN)	50	100	150	175	200	225	250	275	300	310	310	290
Exclusion	0·00	0·19	0·28	0·33	0·39	0·47	0·59	1·10	3·40	5·00	6·40	7·40 (Break)

The original diameter of the test piece was 16 mm and the gauge length was 80 mm. The diameter at fracture was 12·4 mm. Determine

- tesile strength
- Young's modules
- 0·2% proof stress
- % of elongation
- % reduction in area at fracture.

3. a) What is work hardening ?

b) Assuming that a cold worked metal will recrystallise completely in 100 hrs at 260°C but that at 330°C the process is completed in only six minutes. Calculate the activation energy of the recrystallisation process, given that the universal gas constant (R_0) is 8314·4 Jk mol^{-1} K^{-1}. In what time would recrystallisation be completed at 290°C ? 2 + 8

4 a) Compare and contrast sand, investment and die casting in a table of attributes.

b) What factors do you need to consider during designing for casting processes ? 5 + 5

5. a) What are the general design points you need to consider during designing for forging processes ?

b) Discuss cold headed forging processes. 5 + 5

6. a) What are the different losses that take place during forging operation ?

b) Estimate the length of 1·5 cm diameter stock required for hand forging of 500 pieces of rivets as shown in the following figure. Assume scale and shear losses as 6% and 5% respectively of net weight.

Dia.

4 + 6

7. a) Describe direct and indirect extrusion processes with schematic diagram. What are the common extruded products ?

b) State the design aspects you need to consider for extrusion. 7 + 3

8. Describe resistance welding with the following captions :

- Process variations
- Economic variations
- Typical applications
- Design aspects
- Quality issues.

9. a) What is die angular clearance ?

   b) Describe the working principles of flywheel driven eccentric type of mechanical press with a diagram. 2 + 8

10. a) Classify rolling processes.

    b) Describe principle and mechanism of rolling processes using a schematic diagram.

    c) Compare hot rolling and cold rolling processes.

2 + 6 + 2