Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / (Full Time) - END SEMESTER EXAMINATIONS, APR / MAY 2024

MATERIALS SCIENCE AND ENGINEERING

5th Semester

ML5501 & Theory and applications of metal forming

(Regulation- 2015/2019)

Time:3hrs

Max.Marks: 100

CO1	To import knowledge on stress-strain relations and stress tensor approach applied in metal forming
CO2	To import knowledge on fundamentals of metal forming processes
CO3	To import knowledge on principle of metal working, load calculation and the applications of metal working
CO4	To import knowledge on extrusion and drawing processes
CO5	To import knowledge on extrusion and drawing processes

BL – Bloom's Taxonomy Levels

(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A(10x2=20Marks)

(Answer all Questions)

Q.No.	Questions	Marks	CO	BL
1	What is meant by plastic deformation?	2	CO1	L2
2	State the principle of slip.	2	CO1	L1
3	Write the flow rule of ductile materials.	2	CO2	L1
4	What is meant by residual stress?	2	CO2	L2
5	Write the various types of presses used in forging process.	2	CO3	L1
6	What are theoretical assumptions to be considered for analysis of rolling process?	2	CO3	L2
7	What are the variables affecting the extrusion processes?	2	CO4	L2
8	State the limitations of deep drawing.	2	CO4	L1
9	How is stretch forming process carried out?	2	CO5	L2
10	State the applications of forming limit diagram.	2	CO5	L1

PART- B(5x 13=65Marks)

(Restrict to a maximum of 2 subdivisions)

Q.No.	Questions	Marks	CO	BL
11 (a) (i)	State the principle of stress tensor.	5	CO1	L3
11 (a) (ii)	Explain the Von Mises and Tresca yield criterias.	8	CO1	L4
	OR			
11 (b) (i)	What are factors affecting the (i) Plastic deformation (ii) Derive an analysis of octahedral shear stress and shear strain	13	CO1	L4
12 (a) (i)	Write the classification of metal forming processes.	5	CO2	L3
12 (a) (ii)	How to determine the flow stress and effect of temperature.	8	CO2	L3
	OR			
12 (b)	Write the short notes on following term with a neat sketches (i) Deformation zone geometry	13	CO2	L4

13 (a) (ii)	What are various forging defects in forging parts?	**8**	CO3	L3
	OR			
13 (b) (i)	Write the classification of rolling processes and rolling mills.	**5**	CO3	L3
13 (b) (ii)	Explain the various rolling defects, causes and remedies.	**8**	CO3	L3
14 (a) (i)	Differentiate between direct and in-direct extrusion.	**5**	CO4	L3
14 (a) (ii)	Describe various deformation patterns in extrusion process with a neat sketches.	**8**	CO4	L3
	OR			
14 (b)	Explain the following extrusion processes (i) Tube extrusion (ii) Production of seamless pipe and tube Write its advantages and limitations.	**13**	CO4	L3
15 (a)	Explain the fine blanking and adiabatic blanking with a neat sketch write its advantages, limitations and applications.	**13**	CO5	L4
	OR			
15 (b)	What is meant by superplasticity and explain superplastic forming process with a neat sketches write its advantages, limitations and applications.	**13**	CO5	L4

PART- C(1x 15=15Marks)

(Q.No.16 is compulsory)

Q.No.	Questions	Marks	CO	BL
16. a)	The state of stress at a point is given by, σ_x = 70MPa, σ_y = 120 MPa, τ_{xy} = 35 MPa. If the yield strength for the material is 125 MPa, determined in a uniaxial tensile test, whether yielding will occur according to Trasca's and Von-Mises yield conditions or not.	**8**	CO1	L5
16.b)	Explain the following methods of metal forming analysis. (i) Slip line analysis (ii) Upper-bond Technique.	**7**	CO1	L3