

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

END Semester Examination, December 2022

Programme Name: B. Tech- Mechanical

Course Name : Manufacturing Processes

Course Code : MEPD3011

Nos. of page(s) : 2

Semester : V

Time : 03 hrs.

Max. Marks: 100

Instructions:

- i. There are three sections viz. Section A, Section B and Section C. Section A carries 20 marks, Section B carries 40 marks and Section C carries 40 marks
- ii. Attempt all the questions in Section A, B and C
- iii. Make appropriate assumptions wherever required

SECTION A – 20 Marks

S. No.		Marks	CO
Q 1	Draw Caine curve and show the region of good casting. Also, illustrate the importance of Caine curve in casting of steel.	4	CO1
Q 2	Discuss the effect of positive, negative, and neutral back rake angle in metal cutting.	4	CO1
Q 3	Discuss the effect of moving mandrel on surface finish and dimensional accuracy in tube drawing process?	4	CO1
Q.4	Explain rolling defects. How the bending of rolls can be avoided in Rolling Processes.	4	CO2
Q.5	Compare MRR (Metal removal rate) and Tool wear in Electrochemical machining, Electric discharge machining and ultrasonic machining.	4	CO1

SECTION B-40 Marks

Q 6	Explain mechanics of tube drawing process using equilibrium equations.	10	CO3
Q 7	A strip of lead with initial dimensions $24\text{ mm} \times 24\text{ mm} \times 150\text{ mm}$ is forged between two flat dies to a final size of $6\text{ mm} \times 96\text{ mm} \times 150\text{ mm}$. If the coefficient of friction is 0.05, determine the maximum forging force. The average yield stress of lead in tension is 7 N/mm^2 . Sticking length = $L - \frac{h}{2\mu} \ln\left(\frac{1}{2\mu}\right)$ Sliding condition: $P_{x1} = 2K e^{\frac{2\mu}{h}(L-x)}$ Sticking condition: $P_{x2} = \frac{K}{\mu} + \frac{2K}{h}(x_s - x)$	10x	sCO2
Q.8	Compare different electrode polarities (DC, electrode positive; DC, electrode negative; and AC electrode) in terms of penetration, heat generation, metal deposition rate, thickness of the work to be welded and Arc blow.	10	CO3

	OR											
	Explain different types of flames in Gas Welding Process.											
Q.9	<p>Arc length voltage characteristics can be represented by: $V = 20 + 4l$</p> <p>If the arc length in the welding operation varies between 4mm to 6 mm and the current varies between 450 A to 550 A, assuming linear power source characteristic, calculate: (a) Open circuit voltage (b) Short circuit current</p>	10	CO4									
SECTION C (40 Marks)												
Q 10	<p>(a) Sketch Merchant's circle diagram and explain the different quantities involved (b) Mild steel is being machined at a cutting speed of 210 m/min with a tool of rake angle 10°. The width of cut and uncut chip thickness are 3 mm and 0.2 mm respectively. If the value of coefficient of friction between the tool and the chip is 0.5 and shear stress 400 N/mm². Determine: (1) The shear angle (2) Components of machining force</p> <p style="text-align: center;">OR</p> <p>Explain different types of tool wear. The results of machining steel with two grades of tool are given below:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Tool</th> <th>Taylor's experiment</th> <th>Cutting speed for 1 min tool life, m/min</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>0.20</td> <td>100</td> </tr> <tr> <td>B</td> <td>0.25</td> <td>120</td> </tr> </tbody> </table> <p>For a 180 min tool life which tool is recommended and why?</p>	Tool	Taylor's experiment	Cutting speed for 1 min tool life, m/min	A	0.20	100	B	0.25	120	20	CO2
Tool	Taylor's experiment	Cutting speed for 1 min tool life, m/min										
A	0.20	100										
B	0.25	120										
Q.11	<p>Discuss the problems associated with steel casting and suggest methods to overcome the limitations of steel castings. In a sand-casting operation, the total liquid head is maintained constant such that it is equal to the mould height. The time taken to fill the mould with top gates is t_A. If the same mould is filled with a bottom gate, then the time taken is t_B. Ignore the time required to fill the runner and frictional effects. Assume atmospheric pressure at the top molten metal surfaces. Find the relation between t_A and t_B.</p>	20	CO4									