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

CLASS: B. TECH **SEMESTER : VI**
BRANCH: PIE **SESSION : SP/2024**

SUBJECT: PE337 MANUFACTURING SCCIENCE

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.

				CO	BL
Q.1(a)	I.	Cylindrical risers are practically preferred in comparison to spheres – Justify this statement with suitable reasoning.	[1+1 +3]	CO1	BL4 BL1 BL2
	II.	State the preferred ratio of diameter to height for riser used in steel castings.			
	III.	Explain the modulus method for risering design.			
Q.1(b)	I.	Calculate the size of a cylindrical riser (height and diameter are equal) necessary to feed a steel slab casting (25 × 25 × 5 cm), with a top riser casting poured horizontally into the mould using Modulus Method.	[3+1 +1]	CO1	BL3 BL1 BL4
	II.	Define double shrinkage allowance.			
	III.	Wooden patterns utilized for making metallic patterns are given double shrinkage allowance – Explain the statement with proper justification.			
Q.2(a)	I.	Explain the mechanism of cutting operation in sheet metal forming with neat sketches.	[2+1 +2]	CO2	BL2 BL1 BL3
	II.	Define recrystallization temperature.			
	III.	Illustrate the effect of cold working and subsequent annealing on the microstructure and properties of plastically deformed materials with the help of neat sketches.			
Q.2(b)		A cup is to be drawn in a deep drawing operation. The height of the cup is 75 mm and its inside diameter = 100 mm. The sheet metal thickness = 2 mm. If the blank diameter = 225 mm, Determine: (i) drawing ratio, (ii) reduction, and (iii) thickness-to-diameter ratio. (iv) Does the operation seem feasible?	[5]	CO2	BL4
Q.3(a)	I.	Differentiate between orthogonal and oblique cutting.	[2+3]	CO3	BL1 BL2
	II.	Derive that the machining time in shaping is given as $$t = \frac{Lw(1+m)}{1000vf}$$ where L is the length of the stroke, w is the width of the job, m is the ratio of return to cutting stroke time, f is the feed, v is the cutting speed			
Q.3(b)		In an orthogonal cutting test with a tool of rake angle 10°, the following observations were made: Chip thickness ratio = 0.3, Horizontal component of the cutting force = 1290 N, Vertical component of the cutting force = 1650 N	[5]	CO3	BL3
	I.	From Merchant's theory, calculate the various components of the cutting forces and the coefficient of friction at the chip tool interface.			
	II.	Compare the actual shear angle and that obtained from Merchant's theory and estimate the error.			

PTO

Q.4(a)	I.	Classify joining processes with respect to the nature of bonding.	[1+2 +2]	CO4	BL1 BL2 BL5
	II.	Discuss the structure of a welding arc with necessary diagrams.			
	III.	The power source characteristics of two welding processes are given by (a) $\left(\frac{V}{V_0}\right)^2 + \left(\frac{I}{I_s}\right)^2 = 1$ (b) $\frac{V}{V_0} + \frac{I}{I_s} = 1$ where V_0 is the open circuit voltage and I_s is the short circuit current. Among these two processes, which is suitable for (i) manual operation and (ii) semi-automatic operation – Provide a suitable judgement			
Q.4(b)	I.	Derive an expression for the effective resistance of a contact resistance heat source. Clearly state all the assumptions for this derivation.	[2+1 +1+1]	CO4	BL2 BL1 BL1
	II.	Define melting efficiency.			
	III.	Name two welding defects stating their cause.			
Q.5(a)	I.	State two examples of modern manufacturing processes.	[1+2 +2]	CO5	BL1 BL2 BL1
	II.	Explain the effect of nozzle tip distance on the size and shape of the cut in abrasive jet machining with a neat schematic.			
	III.	State the advantages of water jet machining.			
Q.5(b)	I.	Differentiate between straight polarity and reverse polarity in electro discharge machining.	[1+2 +2]	CO5	BL1 BL2 BL2
	II.	Explain the mechanism of material removal in Electro Discharge Machining with a neat sketch.			
	III.	Elucidate the mechanism of material removal in Electron Beam Machining with neat sketches.			

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