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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - THEORY EXAMINATION (2024-2025)

Subject: Manufacturing Science &Technology

Time: 3 Hours   **Max. Marks:100**

General Instructions:

IMP: Verify that you have received question paper with correct course, code, branch etc.

1. *This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*
2. *Maximum marks for each question are indicated on right hand side of each question.*
3. *Illustrate your answers with neat sketches wherever necessary.*
4. *Assume suitable data if necessary.*
5. *Preferably, write the answers in sequential order.*
6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION – A   20

1. Attempt all parts:-

1-a. Which of the following is a condition to avoid the aspiration effect in gating design? (CO1, K1)   1

     a) Bottom gating

     b) Top gating

     c) Streamlined pouring

     d) Proper venting

1-b. Which of the following is a characteristic of investment casting? (CO1, K1)   1

     a) Reusable patterns

     b) High dimensional accuracy

     c) Limited to ferrous metals

     d) Only suitable for large parts

1-c. Which defect occurs due to insufficient clearance in a die? (CO2, K1)   1

     a) Wrinkling

     b) Fracture

c) Spring back

d) Burr formation

1-d. Which type of rolling mill is used for precision work? (CO2, K1) 1

a) Two-high mill

b) Four-high mill

c) Cluster mill

d) Three-high mill

1-e. What is the main function of the coating on welding electrodes? 1
(CO3, K1)

a) To stabilize the arc

b) To increase electrode conductivity

c) To prevent oxidation of the electrode

d) To improve aesthetic finish

1-f. Which welding process is best suited for welding thick plates with 1
high productivity? (CO3, K1)

a) SMAW

b) TIG welding

c) Submerged Arc Welding (SAW)

d) Resistance welding

1-g. Which of the following is true about Merchants' Circle Theory? 1
(CO4, K1)

a) It calculates cutting temperatures.

b) It predicts tool wear.

c) It analyzes cutting forces and angles.

d) It defines cutting fluid characteristics.

1-h. Which of the following factors most significantly affects tool life? 1
(CO4, K1)

a) Material hardness

b) Surface roughness

c) Cutting speed

d) Workpiece geometry

1-i. Which of the following is a key advantage of EDM? (CO5, K1) 1

a) Ability to machine conductive and non-conductive materials

b) No thermal effects on the workpiece

c) High material removal rate for hard materials

d) No tool wear

1-j.	In which process does material removal occur due to chemical reactions? (CO5, K1)	1

a) ECM

b) EDM

c) USM

d) LBM

2. Attempt all parts:-

2.a.	Compare Shell molding, and Investment casting in terms of their typical applications. (CO1, K3)	2
2.b.	Write the process of directional solidification in casting. (CO2, K2)	2
2.c.	What are the common welding defects? (CO3, K2)	2
2.d.	Enlist the various types of tool wear. (CO4, K3)	2
2.e.	Write the working mechanism of Abrasive Jet Machining (AJM) (CO5, K3)	2

SECTION – B   30

3. Answer any <u>five</u> of the following-

3-a.	List and explain the common defects in casting, their causes, and possible remedies. (CO1, K3)	6
3-b.	Compare direct extrusion, indirect extrusion, and hydrostatic extrusion processes. (CO2, K4)	6
3-c.	Describe the principles, advantages, and limitations of SMAW welding processes. (CO3, K2)	6
3-d.	What are the principal zones in a welded joint? Explain their grain structure. (CO3, K2)	6
3-e.	What is chip reduction coefficient? Explain its significance in machining and factors affecting it. (CO4, K3)	6
3-f.	Calculate the tool life using the Taylor's Tool Life Equation $VT^n = C$, where V=100 m/min, n=0.3 and C=300. (CO4, K3)	6
3-g.	Describe the process of ultrasonic machining and its suitability for hard and brittle materials. (CO5, K3)	6

SECTION – C
50

4. Answer any <u>one</u> of the following-

4-a.   Discuss the elements of the gating system in casting and explain the importance of gating design to minimize defects. (CO1,K3)   10

4-b.   Calculate the pouring time for a mold cavity of volume 5 L if the metal density is 7,000 kg/m3, the pouring temperature is 1,500∘C, and the gating system has a coefficient of discharge 0.9. Assume the pouring basin height is 10 cm. (CO1),K3)   10

5. Answer any <u>one</u> of the following-

5-a.   Describe the deep drawing process in sheet metal forming. Discuss factors affecting deep drawing and its defects. (CO2,K4)   10

5-b.   In a flat rolling operation, calculate the roll force required to reduce a 5 mm thick Aluminum sheet to 3 mm. The sheet width is 1.2 m, and the flow stress of Aluminum is 100 MPa.(CO2,K4)   10

6. Answer any <u>one</u> of the following-

6-a.   Explain the significance of Welding Procedure Specifications (WPS) and Procedure Qualification Records (PQR) in ensuring weld quality. (CO3),K2)   10

6-b.   Discuss the causes of welding defects such as porosity, undercut, and cracks. Suggest appropriate remedies for each defect. (CO3,K2)   10

7. Answer any <u>one</u> of the following-

7-a.   Explain the Merchant's Circle diagram and derive an expression for the shear plane angle. (CO4,K3)   10

7-b.   For a chip thickness ratio of 0.5 and shear angle 30^0, calculate the cutting and thrust forces if the normal force on the shear plane is 500 N. (CO4,K3)   10

8. Answer any <u>one</u> of the following-

8-a.   Compare the energy sources and material removal mechanisms in LBM, USM, and WJM. (CO5,K3)   10

8-b.   In ultrasonic machining, calculate the tool vibration amplitude required to achieve a machining rate of 0.1 mm/min for a tool of diameter 10 mm and abrasive grit size 0.02 mm. (CO5 , K3)   10