Printed page: 4 **Subject Code: BME0304**

Roll No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - THEORY EXAMINATION (2025-2026)

Subject Manufacturing Science and 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. Aspiration effect occurs due to (CO1, K1) 1

(a) High pouring temperature

(b) Air entrainment through sprue

(c) Excessive mould hardness

(d) Low fluidity

1-b. Chvorinov's rule gives relation between (CO1, K1) 1

(a) Pouring time and sprue height

(b) Solidification time and $(V/A)^2$

(c) Riser modulus and mould constant

(d) Casting defects and permeability

1-c. In hot rolling, frictional force acts (CO2, K1) 1

(a) Towards roll centre

(b) Opposite roll direction

(c) Toward exit

(d) Zero

1-d. Maximum possible draft in rolling depends on (CO2,K1) 1

(a) Roll diameter

(b) Friction

(c) Roll speed

(d) All of the above

1-e. Heat affected zone (HAZ) appears (CO3,K1) 1

(a) In metal away from weld

(b) In molten pool

(c) Between weld and base metal

(d) Nowhere

1-f. In MIG welding, shielding gas is (CO3,K1) 1

(a) CO_2

(b) Argon

(c) Nitrogen

(d) Hydrogen

1-g. Merchant's equation relates (CO4,K1) 1

(a) Temperature & wear

(b) Shear angle & rake angle

(c) Tool life & speed

(d) Chip thickness & feed

1-h. Dynamometers are used to measure (CO4,K1) 1

(a) Temperature

(b) Tool Wear

(c) Cutting Forces

(d) Chip thickness

1-i. WJM is used for (CO5,K1) 1

(a) Brittle materials only

(b) Soft materials only

(c) Any material depending on pressure

(d) Only metals

1-j. Material removal in EDM takes place due to (CO5,K1) 1

(a) Shear deformation

(b) Mechanical abrasion

(c) Melting and vaporisation

(d) Chemical dissolution

2. Attempt all parts:-

2.a.	What is the function of a riser? (CO1,K1)	2
2.b.	Define hydrostatic extrusion (CO2,K1)	2
2.c.	Write two functions of electrode coating (CO3,K1)	2
2.d.	Define tool life (CO4,K1)	2
2.e.	State one application of LBM (CO5,K1)	2

SECTION – B 30

3. Attempt all parts:-

3.a. Answer any one of the following-

3-a.i	Explain directional solidification and discuss riser design principles (CO1,K2)	6
3-a.ii	Explain the top-gating and bottom-gating systems with neat sketches. (CO1,K2)	6

3.b. Answer any one of the following-

3-b.i	Describe the direct and indirect extrusion processes with applications. (CO2,K2)	6
3-b.ii	Explain defects in rolling and their causes (CO2,K2)	6

3.c. Answer any one of the following-

3-c.i	Explain SMAW process with neat sketch and mention advantages (CO3,K2)	6
3-c.ii	Explain WPS & PQR in brief. (CO3,K2)	6

3.d. Answer any one of the following-

3-d.i	Explain Merchant's circle diagram and derive shear angle relation (CO4,K3)	6
3-d.ii	Differentiate between orthogonal and oblique cutting. (CO4,K2)	6

3.e. Answer any one of the following-

3-e.i	Explain the working principle of ECM with schematic diagram. (CO5,K2)	6
3-e.ii	Differentiate between conventional and non-conventional machining. (CO5,K2)	6

SECTION – C 50

4. Answer any one of the following-

4-a.	Explain Chvorinov's rule. Design a riser using Caine's method for a casting having V = 800 cm^3 and A = 300 cm^2. (CO1,K3)	10
4-b.	Explain centrifugal casting and continuous casting processes with neat sketches. Also describe common casting defects, their causes and remedies. (CO1,K2)	10

5. Answer any one of the following-

5-a.	Explain sheet metal operations: blanking, piercing, lancing, coining, ironing, embossing and spinning. Also discuss punch–die clearances. (CO2,K2)	10
5-b.	Discuss the extrusion process and derive extrusion pressure equation (CO2,K3)	10

6. Answer any one of the following-

6-a.	Explain SMAW and Resistance welding processes with neat sketches, advantages, limitations and applications (CO3,K2)	10
6-b.	Discuss the metallurgy of arc welding. Explain principal zones in weld joint, grain structure, and welding defects (CO3,K2)	10

7. Answer any one of the following-

7-a. Describe in detail the mechanism of chip formation in metal cutting. Explain the different types of chips with neat sketches and conditions for forming each type. (CO4,K2) 10

7-b. Two cutting trials with the same tool/material give the following data: 10

Trial 1: Cutting speed V_1=120 m/min, tool life T_1=50 min.

Trial 2: Cutting speed V_2=200 m/min, tool life T_2=20 min.

a) Determine the exponent *n* and constant C in Taylor's relation VT^n=C.

b) Using the obtained constants, find the expected tool life T at cutting speed V=150 m/min. (CO4,K3)

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

8-a. Explain the working of Laser Beam Machining (LBM). Discuss its machining mechanism, process parameters, advantages, and applications. (CO5,K2) 10

8-b. In EDM, the following parameters are given: 10

- Supply voltage = 80 V
- Discharge current = 25 A
- Pulse on-time = 100 µs
- Pulse off-time = 50 µs
- Work piece material: Steel
- MRR constant = 35 mm^3/s per Joule

Calculate:

1. Energy per spark
2. Number of sparks per second
3. MRR

(CO5,K3)