PAPER ID-310770

Subject Code: KME073

Roll No: | | | | | | | | | | | | | |

BTECH

(SEM VII) THEORY EXAMINATION 2024-25

MATHEMATICAL MODELING OF MANUFACTURING PROCESSES

TIME: 3 HRS **M.MARKS: 100**

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

Q no.	Question	CO	Level
a.	Write the causes of residual stresses.	1	K2
b.	What are the modes of heat transfer in welding?	1	K2
c.	Define Centre-line Feeding Resistance (CFR)?	2	K2
d.	What are the advantages of additive manufacturing process?	3	K3
e.	What is the role of thermoplastic material in P/M injection moulding?	3	K3
f.	What are the principles of plastic processing?	3	K3
g.	Why might chipless machining processes have greater importance in the future?	3	K3
h.	Define principle of powder metallurgy?	4	K4
i.	What is Bio-materials?	5	K5
j.	Mention the factors on which the suitability of the casting operation for a given material depends.	5	K5

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

a.	How mathematical modelling is related problem solving?	1	K2
b.	Draw comparison chart to explain clearly the difference between orthogonal cutting and oblique cutting.	2	K2
c.	Explain in details about solid state welding and its types.	3	K3
d.	Define powder metallurgy process and write its application with advantages.	3	K3
e.	Discuss the importance of finishing and packaging in micro/nano manufacturing. How do these processes ensure reliability and longevity in miniaturized devices?	5	K5

SECTION C

3. Attempt any *one* part of the following: **10 x 1 = 10**

a.	How does friction influence the energy consumption and quality of manufactured products in processes like forging and extrusion?	1	K2
b.	What are the driving forces behind phase transformations in solid-state materials? Discuss with examples from heat treatment processes.	1	K2

4. Attempt any *one* part of the following: **10 x 1 = 10**

a.	A tool is used to machine steel at a cutting speed of 100 m/min. The tool life equation is $VT^n=C$, with n=0.25 and C=300. Calculate the tool life.	2	K2
b.	Discuss the importance of parameter identification in mathematical modeling of machining processes.	2	K2

5. Attempt any *one* part of the following: **10 x 1 = 10**

a.	Describe the mechanics of the deep drawing process. What are the main parameters that affect the success of deep drawing?	3	K3

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b.	Discuss the principles of heat source modeling in welding. How is the temperature distribution predicted in the weld zone?	3	K3

6. Attempt any *one* part of the following: 10 x 1 = 10

a.	Describe the mechanism of shrinkage in metal casting and the methods used to minimize it.	4	K4
b.	What is the principle of powder metallurgy, and how does it differ from traditional manufacturing methods?	3	K3

7. Attempt any *one* part of the following: 10 x 1 = 10

a.	How does the evaluation of microstructure and residual stresses contribute to understanding the performance of materials processed through welding or casting?	5	K5
b.	Describe the principles of micro and nano joining techniques, including laser welding and diffusion bonding. Highlight their applications in electronics and biomedical devices.	5	K5