CBCS SCHEME

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21MT33

Third Semester B.E. Degree Examination, Dec.2023/Jan.2024
Material Science and Manufacturing Technology

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Calculate the APF for BCC crystal structure. **(06 Marks)**
b. Discuss briefly point and line imperfections in crystals. **(06 Marks)**
c. State and explain Fick's second law of diffusion. **(08 Marks)**

OR

2 a. Explain the stress-strain diagram of mild-steel indicating the salient points. **(06 Marks)**
b. Define stiffness, yield strength, toughness and ultimate strength. **(08 Marks)**
c. Explain plastic deformation by slip and twinning. **(06 Marks)**

Module-2

3 a. Explain briefly MMC and CMC. **(10 Marks)**
b. List out the types of reinforcement materials used in composites. **(04 Marks)**
c. Mention the applications of composite materials. **(06 Marks)**

OR

4 a. Define piezo-electric effect. Mention the industrial applications of piezoelectric materials. **(08 Marks)**
b. Explain electro-rheostatic and magneto-rheostatic materials. **(04 Marks)**
c. What is SMA? State the applications of SMA. **(08 Marks)**

Module-3

5 a. Classify the different types of manufacturing processes. **(06 Marks)**
b. Mention the steps involved in preparation of casting. **(06 Marks)**
c. State the advantages and limitations of casting processes. **(08 Marks)**

OR

6 a. With a neat sketch, explain the working of cupola furnace. **(10 Marks)**
b. Explain centrifugal casting and squeeze casting process. **(10 Marks)**

Module-4

7 a. With a neat sketch, explain metallic arc welding process. **(10 Marks)**
b. With a neat sketch, explain Tungsten Inert Gas (TIG) welding process. **(10 Marks)**

OR

8 a. With a neat sketch, explain Thermit welding. (10 Marks)

b. With a neat sketch, explain electron beam welding. (10 Marks)

Module-5

9 a. State the differences between orthogonal and oblique metal cutting. (04 Marks)

b. Define shear zone, shear plane and shear angle. (06 Marks)

c. A carbide tool with mild steel workpiece was found to give life of 2 hours while cutting at 48 m/min. If Taylor's exponent $n = 0.27$, determine:

(i) The tool life if the same tool is used at a speed of 20% higher than the previous one.

(ii) The value of cutting speed if the tool is required to have tool life of 3 hours. (10 Marks)

OR

10 a. What is milling? With a neat sketch, explain the working of vertical milling machine. (10 Marks)

b. What is drilling? With a neat sketch, explain the working of bench drilling machine. (10 Marks)

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