Ref. No.: Ref. No. : Ex/ME/5/T/314/2024

B.E. MECHANICAL ENGINEERING 3rd YEAR 1st SEMESTER EXAM 2024

MACHINING TECHNOLOGY AND METROLOGY

Time: 3 Hrs. **Full Marks: 100**

Answer any five questions from the following

1. a) What is rake angle? Draw the different type of rake angle and explain their effect on machining.
b) A single point turning tool is designated as: 0^0-5^0-8^0-10^0-10^0-60^0- 0 mm (ORS). Sketch the views of the tool to show all the relevant features of it.
c) What is the difference between machine and machine tool? What are the requirements for machining? **7+8+5**

2. a) Discuss the working principle of ECM.
b) An alloy contains Ni (72.5%), Cr (19.5%), Fe (5.0%), Ti (0.4%), Si (1.0%), Mn (1.0%) and Cu (0.6%). The related information about the metals is given below:

Metal	Gram atomic weight	Valency of dissolution	Density (g/cc)
Ni	58.71	2	8.90
Cr	51.99	2	7.19
Fe	55.85	2	7.86
Ti	47.90	3	4.51
Si	28.09	4	2.33
Mn	54.94	2	7.43
Cu	63.57	1	8.96

Calculate the MRR in cm^3/min when a current of 1000 A is passed in ECM process. **10+10**

3. a) Discuss any two tool materials from the following:
   i. ceramics
   ii. coated carbides
   iii. cemented carbides
b) Write down important characteristics of tool materials.
c) Explain tool life with necessary equations. **10+5+5**

4. a) Write down specifications of a lathe.
b) Cast iron and mild steel job are to be machined in a lathe by using HSS and cemented carbide tools. The diameter of job varies from 30 mm to 75 mm. Assuming suitable cutting speeds, determine the speeds of a nine speed gear box considering both AP and GP variation of speeds. **5+15**

5. a) Derive apron constant expression.
b) Discuss different taper turning methods. **10+10**

6. a) Explain quick return mechanism of shaper.
b) Write down specifications of shaper.

[Turn over

c) A shaper is operated at 120 cutting strokes per minute and is used to machine a work piece of 250 mm in length and 120 mm wide. Use a feed of 0.6 mm per stroke and a depth of cut of 6 mm. Calculate the total machining time to for machining the component. If the forward stroke is completed in 230°, calculate the percentage of the time when the tool is not contacting the work piece. **8+6+6**

7. a) Discuss the difference between up milling and down milling.
   b) Draw a figure of twist drill geometry.
   c) Write the specification of a grinding wheel. **8+5+7**

8. a) Write down the definitions of lay, waviness and roughness.
   b) Show different types of flat surface and smooth surface.
   c) Discuss two different wire diameter measurement methods
   d) Draw and explain pneumatic solex comparator. **3+4+6+7**