1 – Explain why the cutting force, F_c, increases with increasing depth of cut and decreasing rake angle?

2 – What is the main advantage of using high-speed machining? Can high-speed machining be performed without the use of a cutting fluid?

3- Why do you think the maximum temperature in orthogonal cutting is located at about the middle of the tool-chip nterface? (Hint: Note that the two sources of heat are (a) shearing in the primary shear plane and (b) friction at the tool-chip interface.)

4- An orthogonal cutting operation is being carried out under the following conditions: t_0= 0.1 mm, tc = 0.2 mm, width of cut = 5 mm, V = 2 m/s, rake angle = 10°, FC = 500 N, and FT, = 200 N. Calculate the percentage of the total energy that is dissipated in the shear plane?

5- Show that, for the same shear angle, there are two rake angles that give the same cutting ratio?

6- Using below equation to predict the ideal surface finish, select an appropriate feed for R = 1 mm and a desired roughness of 1 um. How would you adjust this feed to allow for nose wear of the tool during extended cuts? Explain your reasoning.

$$R_i = \frac{f^2}{8NR}$$

7- Describe your thoughts regarding the recycling of chips produced during machining in a plant. Consider chips produced by dry cutting versus those produced by machining with a cutting fluid?

8- What is tool condition monitoring? Please explain its method?

9- Is material ductility important for machinability? Explain.

10- Derive below equation in orthogonal cutting:

$$\mu = \tan\beta = \frac{F_t + F_c \tan\alpha}{F_c - F_t \tan\alpha}$$