B. Tech. (Sem. - 5th)
MACHINING SCIENCE
SUBJECT CODE : PE - 303
Paper ID : [A0215]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours   Maximum Marks : 60

Instruction to Candidates:

1) Section - A is **Compulsory**.

2) Attempt any **Four** questions from Section - B.

3) Attempt any **Two** questions from Section - C.

Section - A

Q1)   *(10 × 2 = 20)*

a) How do rake angle and clearance angle of a cutting tool affect its life.

b) What is centreless grinding?

c) What are the conditions that would allow a discontinuous chip to be formed in metal cutting?

d) What do you understand by optimum cutting speed? How is it determined.

e) Discuss the relevance of shear angle in metal cutting.

f) What is a satellite tool?

g) Name four variables that affect tool life.

h) What are water-based emulsions.

i) What are end mill cutters?

j) Briefly explain Lee and Shaffer theory.

Section - B

(4 × 5 = 20)

Q2) Draw the Merchant's diagram and write the relationships between different components of the cutting force.

Q3) Explain the working of a two-component lathe dynamometer with the help of a neat sketch.

Q4) Give the heat flow equation for metal cutting and discuss its use for evaluating shear plane temperature.

Q5) A grey cast iron casting plane surface which is 150 mm wide and 450 mm long is to be finished by milling. It can be machined using a face mill of 200 mm diameter with 10 teeth made of cemented carbide. The cutting speed is 70 m/min. and feed per tooth is 0.25 mm. Calculate the machining time for finishing the job if all the stock is removed in a single cut.

Q6) A HSS tool and a carbide tool have the same tool life of 60 minutes at a cutting speed of 75 m/min. The exponent of tool life in Taylor's equation is 0.15 for HSS and 0.2 for carbide. Compare the life of the two tools at a speed of 90 m/min.

Section - C

$$(2 \times 10 = 20)$$

Q7) What is broaching? Draw a neat sketch showing the complete geometry of a broaching tool. Briefly explain the different types of broaching machines used in the industry and their applications. Also give some limitations of broaching.

Q8) (a) What is the method generally used for measuring average chip tool interface temperature? Explain its principle with the help of a neat sketch.

(b) What is the marking system followed in case of grinding wheels? Explain the individual elements of the marking system from the view point of the functioning of the wheel.

Q9) (a) What are the important angles in an orthogonal cutting tool ? Explain the influence of each angle on the machining performance.

(b) In an orthogonal cutting of C35 steel with HSS tool, the following conditions were noted :
width of cut = 1.2 mm, Rake angle = 15°
cutting force = 800N, Thrust force = 800N
Calculate the shear angle and other force components.

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