B. Tech. V Semester   **Time: 2 Hours**   **Max. Marks: 50**
Sub.: Machining Science (MED - 313)

*Instructions: 1) Attempt **all** questions. The weightage of each question is indicated in bracket.*
2) Assume suitable data wherever necessary but write it in the box

Q. 1. (a) Discuss the different types of chips produced in the machining operation.   [5 M]

(b) In an orthogonal cutting operation on a material with yield strength of 250 N/mm^2 the following data is obtained: rake angle of the tool = 15 deg., uncut chip thickness = 0.25 mm, width of chip = 2 mm, chip thickness ratio = 0.46 and friction angle = 40 deg. Determine the shear angle, the cutting force component and resultant force on the tool.
[5 M]

Q. 2. (a) What is surface roughness? Drive expressions for the theoretical roughness of a surface machined with a single point sharp cutting tool and rounded cutting tool.   [5 M]

(b) What are the important properties of tool materials? Discuss the different types of tool materials used in machining operations.   [5 M]

Q. 3. (a) How is the grinding wheel specified? Discuss the wheel designation in details.   [5 M]

(b). How is the life of grinding wheel defined? Discuss the different reasons of wheel failures and grinding ratio.   [5 M]

Q. 4. (a) Drive the expression for length of chip and maximum thickness of chip in case of peripheral surface grinding operation.   [5 M]

(b) Discuss the different abrasive finishing operations: honing, lapping, polishing and buffing. [5 M]

Q.5 (a) Derive the expression for the optimum cutting speed for minimum production cost per component and corresponding tool life.   [5 M]

(b) A cylindrical bar is to be turned. The maximum allowable feed is 0.2 mm/rev. and at this feed the Taylor's tool life equation for a tool work combination is found to be $vT^{0.25}$ = 75, where v = cutting speed in m/min and T = tool life in minutes. The labour cost and overheads are Rs. 0.15 per min and total cost involved in each grinding is Rs. 2.5. On average it takes about 2 minutes to change the tool. Estimate the cutting speed that will lead to the minimum cost, and corresponding tool life. Also, estimate the cutting speed for maximum production rate. [5 M]

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