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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Fifth Semester, B.E. - Industrial and Production Engineering

Semester End Examination; Dec. - 2014

Theory of Metal Cutting

Time: 3 hrs *Max. Marks: 100*

***Note** : i) Answer any **FIVE** full questions selecting at least **TWO** full questions from each part.*
ii) Assume suitable missing data if any.

PART - A

1. a. With a neat sketch, derive the relation for: (i) Shear strain (ii) Shear Plane Angle — 10

   b. With the help of Merchant's circle diagram, derive the relationship among various forces during orthogonal cutting. — 10

2 a. With a neat sketch explain the working of:
   (i) Lathe tool Dynamometer (ii) Milling Dynamometer
   (iii) Tube- type Drill dynamometer. — 15

   b. Explain the working principle of strain ring with a neat sketch. — 5

3 a. Explain the different wear mechanisms responsible for different forms of tools wear. — 8

   b. Briefly explain the effect of cutting parameters on tool life. — 6

   c. In machining a milk steel work piece with carbide tool, the life of the tool was found to be 1 hour and 40 minutes, at a spindle speed of 50 rpm. Determine the tool life if it has to operate at a speed of 30% higher than the initial cutting speed. Also calculate the cutting speed if the tool is required to have a life of 2 hrs and 45 minutes. Assume Taylors exponent, n = 0.28. — 6

4 a. With a neat sketch, explain the Tool Nomenclature of single point cutting Tool. — 8

   b. Explain the different tool Nomenclature systems. — 12

PART – B

5 a. Briefly explain the properties of cutting tool materials — 8

   b. Mention the characteristics , constituents and applications of the following tool materials
   (i) Carbon tool system (ii) SIALON (iii) Cemented carbides. — 12

6 a. With a neat sketch explain Heat Generation in Metal cutting process. — 8

   b. Briefly explain the different factors which are affecting the Heat Generation. — 6

   c. With a neat sketch explain, Tool-work Thermocouple technique for the measurement of cutting tool temperature. — 6

7 a. Briefly explain the functions and properties of cutting fluids. — 10

   b. Explain the different types of cutting fluids and their applications. — 10

8 a. Briefly explain the different types of production cost. — 8

   b. Derive an expression for tool life for maximum profit. — 12

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