## The LNM Institute of Information Technology, Jaipur
### Department of Mechanical-Mechatronics Engineering

## Mid-term Examination

Session : Odd Semester (2016-17)
Branch : MME
Subject : Manufacturing Technology-II
Time : 90 mins

Semester : IV
Max. Marks : 50
Date: 27/02/2018: 5.00 to 6.30 PM

**Instructions :**

i. All questions are compulsory.
ii. Figures to right indicate full marks.
iii. Draw neat sketches, using proper drawing instruments, whenever required.
iv. Use of Non-Programmable calculators is allowed.
v. Clearly mention assumptions wherever required in numerical problems.

| Q.1 | Multiple Choice Questions (There could be one than one correct answer for some questions). One mark each. | (10) |
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i. Which of the following are examples of generating the workpart geometry in machining, as opposed to forming the geometry (a) broaching, (b) contour turning, (c) drilling, (d) profile milling, and (e) thread cutting?

ii. Brittle material are machined with tools having zero or negative rake angle because it (a) results in lower cutting force, (b) improves surface finish, (c) provides adequate strength to cutting tool, (d) results in more accurate dimensions

iii. Which one of the following turning machines permits very long bar stock to be used: (a) chucking machine, (b) engine lathe, (c) screw machine, (d) speed lathe, or (e) turret lathe?

iv. The basic milling machine is which one of the following: (a) bed type, (b) knee-and-column, (c) profiling mill, (d) ram mill, or (e) universal milling machine?

v. End milling is most similar to which one of the following: (a) face milling, (b) peripheral milling, (c) plain milling, or (d) slab milling?

vi. Reaming is used for which of the following functions (three correct answers): (a) accurately locate a hole position, (b) enlarge a drilled hole, (c) improve surface finish on a hole, (d) improve tolerance on hole diameter, and (e) provide an internal thread?

vii. A roughing operation generally involves which one of the following combinations of cutting conditions: (a) high v, f, and d; (b) high v, low f and d; (c) low v, high f and d; or (d) low v, f, and d, where v=cutting speed, f =feed, and d = depth?

viii. Which of the following are characteristics of the orthogonal cutting model: (a) a circular cutting edge is used, (b) a multiple cutting-edge tool is used, (c) a single-point tool is used, (d) only two dimensions play an active role in the analysis, (e) the cutting edge is parallel to the direction of

| | cutting speed, (f) the cutting edge is perpendicular to the direction of cutting speed, and (g) the two elements of tool geometry are rake and relief angle? | |
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| | ix. Which one of the following metals would usually have the lowest unit horsepower in a machining operation: (a) aluminum, (b) brass, (c) cast iron, or (d) steel? | |
| | x. According to the Merchant equation, an increase in rake angle would have which of the following results, all other factors remaining the same: (a) decrease in friction angle, (b) decrease in power requirements, (c) decrease in shear plane angle, (d) increase in cutting temperature, and (e) increase in shear plane angle? | |
| Q.2 | In a turning operation, spindle speed is set to provide a cutting speed of 2 m/s. The feed and depth of cut of cut are 0.25 mm and 3.00 mm, respectively. The tool rake angle is $10^0$. After the cut, the deformed chip thickness is measured to be 0.54 mm. Determine (a) shear plane angle, (b) shear strain, and (c) material removal rate. Use the orthogonal cutting model as an approximation of the turning process.   Feed=3mm/rev  DOC=.25mm | (3) |
| Q.3 | The orthogonal cutting of steel is done with $10^0$ rake tool with a depth of cut of 2mm and feed rate of 0.2mm/rev. The cutting speed is 200m/min. The chip thickness ratio is 0.31. The vertical cutting force is 1200N ad horizontal cutting force is 650N. Calculate from Merchant's theory, the work done in shear and friction during cutting and shear stress. | (10) |
| Q.4 | With neat schematic diagram, explain the constructional features of Lathe. | (10) |
| Q.5 | Describe in words what the Merchant equation tells us. | (2) |
| Q.6 | Draw the neat diagram with proper labelling for open-side planer machine. | (3) |
| Q.7 | Name the types of chips and briefly describe their formation in metal cutting. | (4) |
| Q.8 | Classify unconventional machining processes using tree diagram. | (1) |
| Q.9 | Explain crater and flank wear of cutting tools using schematic diagrams. Explain the effect of cutting speed on flank wear using a graph. | (5) |
| Q.10 | The top surface of a rectangular workpart is machined using a peripheral milling operation. The workpart is 735 mm long by 50 mm wide by 95 mm thick. The milling cutter, which is 60 mm in diameter and has five teeth, overhangs the width of the part equally on both sides. Cutting speed = 80 m/min, chip load = 0.30 mm/tooth, and depth of cut = 7.5 mm. (a) Determine the time required to make one pass across the surface, given that the setup and machine settings provide an approach distance of 5 mm before actual cutting begins and an overtravel distance of 25 mm after actual cutting has finished. (b) What is the maximum material removal rate during the cut? | (2) |