Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

V SEMESTER B.TECH (INDUSTRIAL & PRODUCTION ENGG.)

END SEMESTER (MAKE-UP) EXAMINATIONS, DEC 2015/JAN 2016

SUBJECT: MACHINE TOOL TECHNOLOGY [MME 319]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitable assumed.

1A. A 30 mm deep hole is being drilled in a block of magnesium alloy with a 10 mm carbide drill at a feed of 0.3 mm/rev and at 200 m/min cutting speed. Calculate the speed of the drill spindle. Define working motions and explain with neat sketch the working motions involved during the above operation **03**

1B. State reasons which necessitate the variation of spindle speed in machine tools. **02**

1C. A drilling machine with a nine speed gear box is used for drilling the holes in the manufacture of certain bushes. The diameter of the holes varies from minimum diameter of 5mm to a maximum diameter of 12.5mm. The optimum cutting speed to be selected for this drilling operation is 22 m/min. i) Write the standard values of all nine spindle speeds. ii) Draw the optimum structural diagram and speed chart. The drive to the input shaft is from a 1KW motor running at 1400 rpm. Iii) Calculate Number of teeth and module of the gears used in the gear box. ii) Determine Diameter of the spindle shaft. Assuming C-40 steel (Ultimate shear strength = 600 N/m2) for spindle shaft material. **05**

2A. Derive the relationship between step ratio, the number of steps & speed range ratio. Also show the relationship graphically. **03**

2B. A stepped cone pulley with back gearing arrangement is used to obtain the spindle speed. The diameters of the steps of the stepped cone pulley are 300mm, 270mm, 240mm and 215mm. Draw the speed diagram and calculate: i) The speeds of the spindle, if the counter shaft rotates with 200rpm. ii) Diameter of the spindle if the input from a 1KW motor. Assume C-40 steel (ultimate shear strength = 600 N/mm2) for spindle material. iii) Back gear ratio. **04**

2C. What is range ratio for a machine tool? What is the criterion for selection of this value? Draw the speed spectrum for 20, 40, 56 and 80 rpm by establishing D-lines **03**

3A.	What are the essential requirements for proper functioning of a gear transmission with sliding clusters?	**04**
3B.	Show the arrangement of change gears for cutting 5.25mm pitch on the job with a lead screw of 6TPI.	**02**
3C.	Show the arrangement of feed box with Meander's mechanism to obtain eight feeds and show that feed rates obtained at the feed rod form a geometric progression.	**04**
4A.	Explain the optimum design criterion for machine tool structures.	**04**
4B.	Draw with neat sketches the commonly used shapes of slide-ways in machine tools.	**04**
4C.	What kind of disturbances from the drive can cause vibration? Explain.	**02**
5A.	Sketch the pressure distribution on slide way (along slide way length) and derive an expression for maximum pressure.	**04**
5B.	A box section is considered to be best for beds and columns of machine tool among various sections of equal cross-sectional area. Justify.	**02**
5C.	Determine deflection of spindle axis due to bending of spindle supports in machine tool by considering the spindle is supported rear ball bearing and front sleeve bearing.	**04**
6A.	Explain briefly the important geometrical tests carried out on spindle of a drilling machine during the alignment test.	**04**
6B.	Why milling machine spindle have steep taper? With a neat sketch show the spindle end for milling machine spindle.	**02**
6C.	Briefly explain with example control system with Pre-selective centralized control.	**04**