Reg. No.										
----------	--	--	--	--	--	--	--	--	--	--



Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



VI SEMESTER B.TECH (MECHANICAL ENGINEERING) END SEMESTER EXAMINATIONS, MAY 2016

SUBJECT: MACHINE TOOL TECHNOLOGY [MME 308]

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 100 mm wide and 200 mm long surface is to be machined on a shaper, using feed per stroke of 0.3 mm. If the cutting speed is 200m/min and the ratio of return time to cutting time is 1: 1.25, calculate the feed per minute of the shaper. Explain with neat sketch the working motions & parameters defining working motions involved in the above operation.
- 1B. A lathe gear box is to be designed for 12 speeds ranging from 140 to 1800 rpm with standard speed step ratio. The drive to the input shaft of a gear box is from a 2 KW motor through belt and pulley arrangement. The rpm of the input shaft is 1400 rpm. Determine the number of teeth, module and face width of all gears. Assume C-60 steel (Material Constant = 40 MPa) for gear material.
- **1C.** Explain the working of Wulfel-Kopp tourator used in machine tools with neat sketches.
- **2A.** In a radial drilling machine, a transmission reduction of 1/8 is provided before entering the feed gear box from the spindle. After the feed gear box, the transmission reduction is through worm and worm wheel (double start worm and 100 teeth worm wheel) and rack pinion drive (rack pinion has 18 teeth and module 4mm). Find the various feeds of the spindle if the spindle rotates with 250 rpm. Show with a neat sketch feed layout and the mounting of drill spindle on proper bearings with spindle end.
- **2B.** With a neat sketch explain how six feed rates are obtained by Meander's mechanism.
- **2C.** Explain the shaft size minimization criterion in the decision making for the best structural diagram of a speed box.

04

03

04

03

03

3A.	Derive the expression for the forces acting on the mating surfaces in a combination of V and flat slide-ways for the case of orthogonal cutting with schematic diagram.	04
3B.	Show with the neat sketch kinematics of thread cutting by change gears for cutting 5.25mm pitch on the job with a lead screw of 6TPI.	03
3C.	Show from the analysis of productivity loss that it is always desirable that the ratio between two consecutive speed steps of a stepped drive should be between 1 and 2.	03
4A.	Draw the structural diagrams for different structural formulae for the speed step combination of $3 \times 2 \times 2$.	03
4B.	 A stepped cone pulley with back gearing arrangement is used to obtain the eight spindle speeds are in GP. The diameters of the steps of the stepped cone pulley are in the ratio of 1.12. (i) Draw the speed diagram & calculate the speeds of the spindle with a maximum speed of 200 rpm. (ii) Find back gear ratio and number of teeth on the back gear. 	04
4C.	Derive and compare the weights of two cylindrical bars of same length subjected torsional moment and hence define unit strength under torsion.	03
5A.	Prove that design of a machine tool structure depends upon operation constraints and the material of the structure.	05
5B.	Check the feasibility of structural formula $2(3) \times 3(1) \times 2(6)$ for Geometric progression ratio of 1.58.	02
5C.	Explain the design methodology steps involved in design of machine tool spindles for strength.	03
6A.	Determine deflection of spindle axis due to bending and compliance of spindle supports in machine tool by considering the spindle is supported by rear ball bearing and front sleeve bearing.	04
6B.	Draw the slide way profiles used for beds of Surface-grinding machines and General purpose lathes.	02
6C.	What are the sources of vibration in machine tool? Explain.	04
