Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
A Constituent Institute of Manipal University, Manipal

VI SEMESTER B.TECH (MECHANICAL & IP ENGG.) END SEMESTER EXAMINATIONS, APRIL/MAY 2017

SUBJECT: PE-IV, MACHINE TOOL TECHNOLOGY [MME 4008]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Draw neat sketches wherever is required.

1A. Why the variation of the spindle speeds is necessary in machine tools? For a given diameter, feed, depth of cut, the rate of production is dependent on rpm. However the rpm cannot be increased without any limit. Explain the constraints. **05**

1B. Explain the guidelines for selecting standard values of geometric progression ratio. **03**

1C. Derive the expression for determining the module based on beam strength of gear teeth in machine tool gear box. **02**

2A. Check the feasibility of structural formula 2(3) x 3(1) x 2(6) for Geometric progression ratio of 1.58. **02**

2B. Draw the all possible structural diagrams for six speed steps. From among all the possible structural diagrams, explain how to select the best version. The minimum and maximum speeds required are around 460 and 1400 rpm. Drive speed is 1440 rpm. Construct speed diagram of the gear box and obtain various reduction ratios. Use standard output speeds and standard step ratio. Calculate number of teeth in each gear and verify whether the actual output speeds are within + 2% of standard speeds. **05**

2C. What are the advantages of a step less drive? Sketch & explain the working of face plate variator with friction discs used in machine tools. **03**

3A. Prove that the diameter step ratio of the stepped cone pulleys will be equal to the square root of the GP ratio of the speeds available with stepped cone pulley drive. **03**

3B. Derive the kinematic relationship for thread cutting using change gears. Explain the constraints must be satisfied while selecting the change gears. To meet what situation it is essential to have a translating gear in the change gear set. **04**

3C. Give some reasons for slide-way wearing. What is the need for wear adjustment in slide-ways? Explain with neat sketch how this wearing is compensated in flat slide-way. **03**

4A. Define “dynamic stiffness” and “amplification factor”. How the dynamic stiffness is related to natural frequency of the element of machine tool structure? Explain with an example. **03**

4B. Why a box section is considered to be best for beds and columns of machine tool among various sections of equal cross-sectional area? However openings and apertures have to be provided in box for housing bearings, chip flow etc. and these have adverse effect. Show schematically how then adverse effect with apertures can be modified? **03**

4C. Determine the maximum pressure on flat slide way which is being subjected to the normal force with trapezoidal pressure distribution along slide way length. **04**

5A. What are the sources of vibration in machine tools? Explain. **05**

5B. What are the important design requirements to machine tool spindle unit? Explain. **02½**

5C. Prove that displacement of the front bearing has greater influence upon deflection of spindle nose due to compliance of spindle supports than displacement of the rear bearing. **02½**

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