Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH (MECHANICAL & IP ENGG.) END SEMESTER EXAMINATIONS, APRIL 2018

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. What are the parameters required for defining the working motions of a machine tool? **02**

1B. Why do you need change in the lathe spindle speed, explain?
How the highest & lowest speeds for a machine tool are selected & explain the importance of range ratio. **03**

1C. Derive the expression for GP ratio (Ø) limitation (1<Ø<2) for machine tool stepped drive system. **02½**

1D. Explain Minimum total shaft size factor for the selection of the best version from among all the possible structural diagrams. **02½**

2A. Calculate the number of teeth of gears in an all geared speed gear box for a radial drilling machine with the following specification:
Maximum size of the drill to be used = 50 mm
Minimum size of the drill to be used = 10 mm
Maximum cutting speed (drilling) = 40 m/min
Minimum cutting speed (reaming, taping & boring) = 6 m/min
Number of speed steps in 3 stages = 3 x 2 x 2 **05**

2B. Sketch & explain the working of Meander`s drives used in feeds. **03**

2C. What kind of disturbances from the drive can cause vibration in machine tools? Explain. **02**

3A. In a four steps stepped cone pulley with back gearing arrangement, the diameters of the steps of the stepped cone pulley are 140mm, 175mm, 220mm, 275mm. Find the maximum speed of the drive is, if the minimum speed of the drive is 63 rpm. Draw the speed diagram and calculate the number of teeth on the back gear. **03**

3B. A bed subjected to torsional loading is constructed as a closed box type structure, while a bed subjected to bending as an I-section. Why? Give mathematical proof to support your conclusion. **04**

3C. Draw the various open slide way profiles. Give some reasons for slide-way wearing. **03**

4A. Explain with neat sketch the step less regulation of speed obtained through the variator with axially displaceable cones and belt-type intermediate member. **03**

4B. The various forces acting on the spindle are shown in figure Q No. 4B. Determine the outer and inner diameter of lathe spindle if their ratio is 2. The power at the spindle is 5kW and rotates at 900rpm. Assume steel having permissible stress as 100MPa. **04**

4C. Define unit strength under bending. Derive an equation defining the unit strength under bending by comparing the weights of two bars of identical length subjected to a bending moment. **03**

5A. List the various types of Anti-friction bearing and state the parameters to be assessed while selecting the number of possible combinations of various anti-friction bearings that can be employed in machine tool spindle. **03**

5B. A lathe has two flat, cast iron slide ways of equal width and height half the width. While turning a 100 mm diameter work piece, the tangential, radial and axial components of the cutting force were found to be 3000 N, 1300 N, and 1200 N, respectively. The lathe carriage weights 1500 N and is 600 mm long. Width of the slide way is 60 mm. Distance between guide way centers is 500 mm. Height of spindle center from guide way is 135 mm. Determine the pulling force if the coefficient of friction between the sliding surfaces is 0.1. **04**

5C. Prove that the rotational accuracy is influenced maximum by the stiffness and accuracy of spindle bearings, particularly the one loaded at the front end. **03**

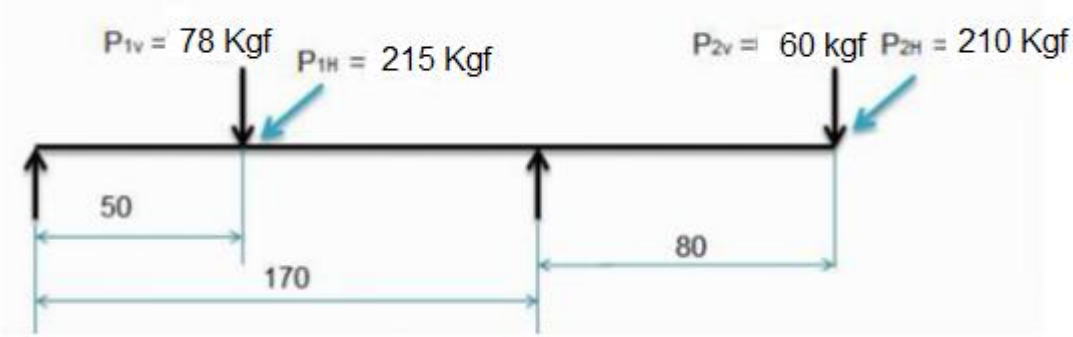

FIG Q NO: 4B

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