Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VI SEMESTER B. TECH (MECHANICAL / I.P. ENGG.) END SEMESTER EXAMINATIONS, JUNE 2019

SUBJECT: MACHINE TOOL TECHNOLOGY [MME 4008]

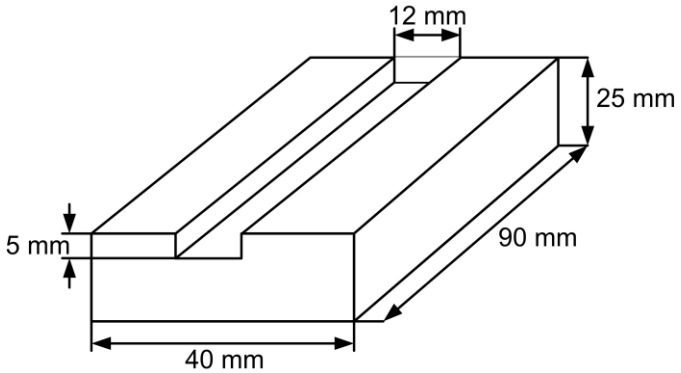
REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. A keyway is to be machined using a shaping machine as shown in the Figure. Cutting speed is 8 m/min, return to cutting time ratio is 1:2, feed is 3 mm/double stroke, clearance at each end is 20 mm and maximum depth per pass is 2 mm. Determine the total time needed to machine the keyway using a 12 mm wide shaping tool. Also, explain with neat sketch the working motions involved during the above operation and parameters defining working motions.



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1B. Determine the relationship between number of speed steps, progression ratio and range ratio for a machine tool. **3**

1C. Why variation of the spindle speeds is necessary in machine tools. **2**

2A. The minimum and maximum spindle speed for a six seed gear box are 325 and 1000 rev/min respectively. The speed box is connected to a 4 kW motor running at 1000 rev/min. (i) Construct the speed chart. (ii) Calculate the number of teeth on each gear. (iii) Determine the diameter of the output shaft. Assume C-40 steel (Shear strength = 100 N/mm^2) for shaft material. Some of the standard spindle speeds are 125, 160, 200, 250, 315, 400, 500 630, 800 and 1000 rev/min. **4**

2B. List the essential requirements for proper functioning of a gear transmission with sliding clusters. **3**

2C. A stepped cone pulley with back gearing arrangement is used to obtain the eight spindle speeds. The diameters of the steps of the stepped cone pulley **3**

are in the ratio of 1.12. (i) Draw the speed diagram, (ii) Calculate the speeds of the spindle with a maximum speed of 200 rev/min. (iii) Back gear ratio and number of teeth on the back gear .

3A. Illustrate the working of a feed box provided with Apron mechanism. **3**

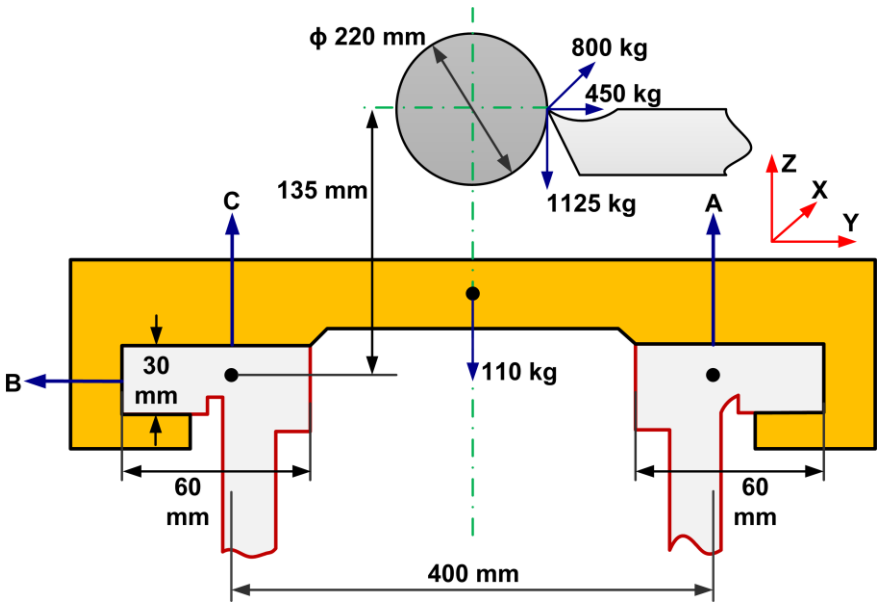
3B. Why change gears having 47, 97, 127 and 157 teeth are essential while thread cutting on a lathe. **3**

3C. State and sketch the guideways used in (i) Cross slide of a lathe, (ii) Pillar of radial drilling machine, (iii) Heavy duty boring machines, (iv) Surface grinding machines. **4**

4A. For a lathe having two flat slide ways of equal width, determine the normal forces acting on the mating surfaces under oblique cutting conditions. **3**

4B. What are anti-friction guideways? State their advantages over conventional guideways. How can high stiffness be achieved in anti-friction guideways? **3**

4C. The schematic diagram of the slide way and the forces acting on the system are shown in the figure for oblique cutting condition. Determine the normal forces acting on the mating surfaces, pulling force and the average pressure values for the combination flat guideway shown in the Figure assuming a friction coefficient of 0.2. (Length of the carriage = 300 mm).



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5A. Prove that deflection of the spindle axis due to compliance of the spindle supports is influenced greatly by front bearing. **4**

5B. With a sketch explain the working of a hydrostatic bearing. Also list its advantages over hydrodynamic bearings. **3**

5C. How can the vibration behavior of a machine tool be improved? **3**