

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH (MECHANICAL & IP ENGG.) **END SEMESTER MAKE-UP EXAMINATIONS, JUNE 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.** Define working motions. Explain working motions and parameter defining working motions of a machine tool in which drive motion is a reciprocating 03 motion.
- **1B.** A machine spindle is to operate on ferrous metals at 30 m/min and is required to have six speeds. The spindle can accommodate HSS cutters ranging from 10 mm to 60 mm. Determine the spindle speeds. Plot a graph between cutting velocity and cutter diameter for each spindle speed and find 04 the range of cutting velocity for 12 mm cutter and 36 mm cutter.
- **1C.** Draw the structural diagram for the structural formula $2(X_3) \times 2(X_2) \times 3((X_1))$ where X₁, X₂, X₃, are the characteristics of the transmission group. What do you mean by characteristic of the transmission group? Calculate the 03 transmission range for each transmission group.
- 2A. What are the essential requirements for proper functioning of a gear transmission with sliding clusters speed box? 02¹/₂
- **2B.** With the help of a neat sketch show how would you cut metric thread of 1.5 mm pitch with a whit worth lead screw of 27 TPI by employing change gears 02¹/₂ with translating gear.
- **2C.** Figure Q No. 2C shows a sliding mesh gearbox in which input shaft pulley B, with 370 mm diameter, is driven by belt drive. 4 kW Motor is running at 1440 rpm and pulley A has diameter 180 mm. Number of teeth on each gear is mentioned in the diagram. Study the diagram carefully and answer the following questions.

a) Find out all standard spindle speeds. b) What is structure formula of this setup? c) Draw Speed diagram. d) Determine the diameter of the output 05 shaft, assuming steel as shaft material

- **3A.** Prove that for machine tool structure, there exists an optimum ratio L^2/D (where L = length and D = depth of the structure) depending upon:
 - (i) Operation constraints and (ii) the material of the structure

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- **3B.** Draw the various closed slide way profiles. Mention the positive features of anti-friction ways.
- 3C. Draw the spindle ends for milling and drilling machine. Why milling machine spindle end will have steep taper & drilling machine spindle end will have Morse taper?
- 4A. During the turning on a work piece held between centres, the tangential cutting force component was 150 kgf and the radial 80 kgf. If the work piece is 500 mm long and has a diameter = 80 mm, determine the deflection when the tool is 200 mm from the headstock. The headstock and tailstock stiffness is 35,000 and 15,000 kgf/cm, respectively.
- **4B.** Illustrate the apron mechanism for longitudinal feed motion of carriage with a neat sketch.
- **4C.** What are the important design requirements to machine tool spindle unit?
- **5A.** Explain the different types of machine tool vibrations & their causes.
- 5B. 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
- **5C.** What do you understand by unit rigidity and unit strength of the material in tension for machine tool bed design?



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