L4-/T-2/IPE Date: 11/01/2025

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-2 B.Sc. Engineering Examinations 2022-2023

Sub: **IPE 401 (Machine Tools)**

Fahim 29.1.25

Full Marks: 280 Time: 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE** questions.

1. (a) Explain the purposes and location of the carriage and it's 7 main parts. **(20)**

   (b) Is it possible to make a lathe machine with only a lead screw (without feed rod) that can perform both the turning and threading operation? Justify your answer? **(10)**

   (c) Explain the role of change gear train in cutting precision threads. Also discuss different types of Mandrels with necessary sketches. **(8+8⅔=16⅔)**

2. (a) Explain the mechanisms of gripping work piece by 3 Jaw self-centering, 4 Jaw independent and Collet chucks with necessary sketches. **(18)**

   (b) In which method of taper turning, do you need to disengage the feeding screw of the cross slide? Explain the method with necessary sketch(es). **(12)**

   (c) Discuss the principle of helical gear cutting process with necessary diagram. Also discuss Ram Head type milling machine in detail. **(12+4⅔=16⅔)**

3. (a) Discuss the principle of Multiple Tool Shaping Cutter Head with its advantages and disadvantages. **(12)**

   (b) Discuss the Feed-in motion and withdrawal motion of gear shaper in detail. **(12)**

   (c) What are the requirement of slide ways? Explain different types of slide ways with necessary sketches. **(22⅔)**

4. (a) Explain briefly the types of acceptance test? Also explain a method for checking the accuracy of an Engine lathe. **(15)**

   (b) What are the necessities of Ribs/Fasteners in machine tool structure? What should be the appropriate arrangement of Ribs/Fasteners in order to address the rigidity and weight in machine tool structure? Explain briefly with necessary sketches. **(15)**

   (c) How the location of bearing in the lathe spindle does affect the machining accuracy? Explain appropriate location of bearing for optimum machining accuracy. **(16⅔)**

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IPE 401

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE** questions.

5. (a) Show that, the maximum relative loss of economic cutting speed is a function of diameter for a certain machine following the Arithmetic Progression (AP) series. **(10)**

(b) For $Z = 3 \times 2 \times 2$, draw all possible ray diagrams and select the best ray diagram considering minimum total shaft size **(25)**

(c) Explain the different types of drilling operations with neat sketches for each type operation. **(11⅔)**

6. (a) Why should we select the optimum speed and feed rates for machining operations? Differentiate stepped speed regulation from step-less speed regulation. Briefly explain different mechanical ways of step-less speed regulation with necessary sketches. **(20)**

(b) Explain the working principle of Wuelfel-Kopp Tourator with a neat sketch. Show that its transmission ratio is independent of the effective disc diameter and depends entirely upon the angular position of the shafts that carry the spheres. **(15)**

(c) Deduce a mathematical relation among Z, R_n, and Φ, where the symbols bear the usual meanings when the speed constitutes a geometric progression. **(11⅔)**

7. (a) Compare and contrast the electromagnetic and permanent magnetic chuck used in surface grinding machines. Discuss their working principles, advantages, and typical applications. **(11⅔)**

(b) Discuss the application of jigs and fixtures in machining processes. Explain the principles of locating and clamping used in their design. **(18)**

(c) Classify hydraulic pumps and explain the working principles of gear pumps, screw pumps and vane pumps and briefly discuss their advantages and limitations. **(17)**

8. (a) Classify machine tools based on the following characteristics **(15)**

a. Method of actuation
b. Size
c. Purpose
d. Types of motion
e. Feed

(b) Prove that the difference in teeth number of two adjacent gear in a cluster gear should be at least 4 if the module of the gear remains same. **(11⅔)**

(c) Explain the construction and working of a Norton Gearbox with the help ~~Gearbox with help~~ of a neat and labeled diagram. Discuss its applications and advantages in machine tools. **(15)**

(d) What are the requirements of machine tools? **(5)**
