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UNIVERSITY EXAMINATIONS 2024/2025

SECOND YEAR FIRST SEMESTER EXAMINATION FOR DEGREE OF BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING

EMT 3205: MECHANICAL TECHNOLOGY AND PRACTICE II

DATE: JANUARY 2025

TIME: 2 HOURS

INSTRUCTIONS: Answer Question ONE and any other TWO questions.

QUESTION ONE (20 MARKS)

- a) State three mechanisms through which reciprocating motion can be achieved in shaping machines. (3 marks)
- b) Explain the difference between three milling and thread grinding stating where each process is suitable (4 marks)
- c) Outline four different ways of specifying drilling machines (4 marks)
- d) Using neat diagrams, illustrate the two types of feed used in thread cutting using lathe machines (4 marks)

QUESTION TWO (10 MARKS)

- a) Explain the meaning of lathe (1 mark)
- b) Outline four factors which influence chip formation during lathe machining operation. (4 marks)
- c) A taper turning operation is to be carried out on a 40 mm diameter workpiece on lathe machine with a feed of 2.5 mm/rev , and a spindle speed of 1200 r.p.m. If the workpiece is 60 mm long, calculate:
 - i) Cutting speed (2 marks)
 - ii) Machining time (3 marks)

QUESTION THREE (10 MARKS)

- a) Describe two types of shaping machines based on table design (2 marks)
- b) An operation is to be done to machine a cast iron surface 350 mm long and 200 mm wide on a shaper with cutting-to return ratio of 5/3. A cutting speed of 30.25 m/min, a feed of 4 mm/stroke and a clearance of 35 mm will be used. The available ram strokes on the shaper are: 28, 40, 48, 60 and 90 strokes/min. Assuming a depth of cut of 5mm,
- i) Determine, with proper justification, the required number of double strokes per minute. (4 marks)
 - ii) Estimate the time required for the machining operation (2 marks)
 - iii) Calculate the material removal rate (2 marks)

QUESTION FOUR (10 MARKS)

- a) State one benefit and one limitation of using chip breakers when carrying out drilling operations (1 mark)
- b) Explain the difference in counter boring and counter sinking drilling operations (2 marks)
- c) A 20 mm hole is to be drilled in an aluminium block at a feed rate of 0.2 mm/rev with specific cutting energy of 2000 N/mm². Calculate the following:
- i) Drilling torque (3 marks)
 - ii) Material removal rate (2 marks)
 - iii) Drilling power (2 marks)

QUESTION FIVE (10 MARKS)

- a) Explain the difference between tapping and threading (2 marks)
- b) Using a neat diagram, illustrate the features that define the geometry of a tap (4 marks)
- c) By taking into account the length of approach, find the time required for drilling a 25 mm wide blind hole in a workpiece having thickness 80 mm. Assume cutting speed 20.5 metres/min and feed 0.35 mm /revolution. (4 marks)