

III B. Tech I Semester Regular Examinations, October/November - 2018

METAL CUTTING AND MACHINE TOOLS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. Answer **ALL** the question in **Part-A**
 3. Answer any **FOUR** Questions from **Part-B**
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PART -A

1. a) Determine the cutting speed and machining time per cut when the work having 40 mm diameter is rotated at 300 rpm. The feed given is 0.1mm/rev and length of cut is 65mm. [2M]
- b) Write a short note on four jaw independent chuck. [2M]
- c) How do you specify a Slotting machine? [2M]
- d) What is indexing head? What is importance in milling machine? [3M]
- e) How do you Specify a Grinding Wheel [3M]
- f) Write any two differences between jigs and fixtures. [2M]

PART -B

2. a) Explain the nomenclature of single point cutting tool. [7M]
- b) Prove that : $\tan \phi = \frac{r \cos \alpha}{1-r \sin \alpha}$ [7M]
3. a) How does the apron mechanism of a lathe works? Explain with the help of a neat diagram. [7M]
- b) How the sizes of Turret and Capstan lathes specified? [7M]
4. a) What is a 'twist drill'? Make a neat sketch of it and show different parts on it. [7M]
- b) A C.I. plate measuring 300mm×100mm×40mm is to be rough shaped along its wider face. Calculate the machining time take approach = 25mm; over travel = 25mm; cutting speed = 12m/min; return speed = 20m/min; allowance on either side of the plate width = 5mm and feed per cycle = 1 mm. [7M]
5. a) Sketch and describe a Vertical milling machine. [7M]
- b) Sketch and describe the following milling cutters. [7M]
 - i) Slab milling
 - ii) Face milling
 - iii) Staggered teeth side mill.
6. a) Write any seven advantages of center less grinding. [7M]
- b) Explain about reciprocating table type surface grinders. [7M]
7. a) What are the essential factors will you consider while designing a jig or fixture. [7M]
- b) Explain the working principle of CNC machine with neat sketch. [7M]



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PART -A

1. a) Determine the cutting speed and machining time per cut when the work having 25 mm diameter is rotated at 225 rpm. The feed given is 0.2mm/rev and length of cut is 55mm. [2M]
- b) Write a short note on angle plate used in lathe. [2M]
- c) How do you specify a Planning machine? [2M]
- d) Write any three differences between end milling and face milling. [3M]
- e) What are the natural abrasives used in grinding? Explain. [3M]
- f) Write the fundamental principles of jigs and fixtures. [2M]

PART -B

2. a) How is tool life influenced by the following factors? [8M]
 i) Tool material ii) Workpiece material iii) Rigidity of the machine tool
 (iv) Use of cutting fluids.
- b) List the common methods of chip breaking and what are the means used for the same. [6M]
3. a) Write any four operations that can be performed on a lathe machine with diagrams. [8M]
- b) What is a turret saddle? Describe its function in brief. [6M]
4. a) What is jig boring machine? With the help of a block diagram, describe the main features of a boring machine. [7M]
- b) How slotting machine is specified and write the main parts of a slotting machine. [7M]
5. a) Sketch and describe a Universal milling machine. [7M]
- b) Write a short note on the following milling operations. [7M]
 i) End milling ii) Profile milling and iii) Gang milling.
6. a) Write a short note on rotary table type surface grinder. [7M]
- b) Why 'trueing' and 'dressing' are necessary in grinding wheels? Describe a few methods dressing an abrasive wheel. [7M]
7. a) What is the principle of 'six point location'? Explain. [7M]
- b) Write any seven applications of CNC machines. [7M]



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PART -A

1. a) Determine the cutting speed and machining time per cut when the work having 45 mm diameter is rotated at 350 rpm. The feed given is 0.18 mm/rev and length of cut is 75mm. [2M]
- b) Write a short note on Carriers or Dogs used in a lathe machine. [2M]
- c) How do you specify a Shaping machine? [2M]
- d) Explain slot milling operation with a diagram. [3M]
- e) What is super finishing? Write any three features of it. [3M]
- f) Write the essential features of jigs and fixtures. [2M]

PART -B

2. Draw Merchant's Circle Diagram and derive expressions to show the relationships among the different forces acting on a cutting tool and different parameters involved in metal cutting. [14M]
3. a) Explain taper turning by tail stock set over method with a neat diagram. [7M]
- b) Describe a single spindle bar automatic lathe in detail. [7M]
4. a) What are the common operations that can be performed on a drilling machine? Explain any four of them with neat diagrams. [7M]
- b) Explain the working of a hydraulic quick return mechanism of a shaper. [7M]
5. a) Sketch and describe about a Horizontal milling machine. [8M]
- b) Explain the working of a 'Universal dividing head 'with a diagram. [6M]
6. a) What is the use of cylindrical grinders? Explain the principle of cylindrical grinding. [7M]
- b) Write short notes on i) lapping ii) Honing. [7M]
7. a) What are the different types of locating pins you know? Illustrate and explain their uses. [7M]
- b) Explain about the construction features of CNC machine. [7M]



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PART -A

1. a) Determine the cutting speed and machining time per cut when the work having 50 mm diameter is rotated at 400 rpm. The feed given is 0.2mm/rev and length of cut is 60mm. [2M]
- b) Write a short note on mandrels used as a lathe accessory. [2M]
- c) How do you specify a Boring machine? [2M]
- d) Write any three merits of indexing method in milling machine. [3M]
- e) Write any three differences between honing and lapping. [3M]
- f) What are the different materials used for jigs and fixtures? Explain the importance of any one material. [2M]

PART -B

2. a) In an orthogonal turning operation on a lathe the following data were obtained [10M]
Cutting speed = 120m/min; Diameter of work piece = 100mm; cutting force = 180kg; Feed force = 60kg; Back rake angle = 10^0 ; Feed rate = 0.3mm/rev; Chip thickness = 0.4mm; Depth of cut = 0.3mm.
Calculate chip thickness ratio, shear plane angle, coefficient of friction, friction angle, shear stress, shear strain, strain energy and chip flow thickness.
- b) What are 'Crater wear' and 'Flank wear'? Explain. [4M]
3. a) What are multi – spindle automatic machines and how do you classify them. [7M]
- b) Explain taper turning by taper turning attachment method with a neat diagram. [7M]
4. a) What is Jig boring machine? Describe its construction and working in detail. [7M]
- b) Explain the working of a slotted disc mechanism for driving the ram of a slotting machine. [7M]
5. a) What is the working principle involved in a milling operation. How are they classified? [6M]
- b) Explain and solve how to make 51 divisions on a work piece by using compound indexing method. [8M]
6. a) What is lapping? How is it done? How many types of lapping operations are there? Explain. [7M]
- b) What are the different types of bonds used in the manufacture of abrasive wheels? Explain. [7M]
7. a) What are the basic principles involved in designing a clamping device for a jig or fixture. [7M]
- b) Explain about different types of motion controls in CNC machines. [7M]

