

GUJARAT TECHNOLOGICAL UNIVERSITY**PDDC - SEMESTER-VII • EXAMINATION – WINTER 2013****Subject Code: X71902****Date: 05-12-2013****Subject Name: Production Technology****Time: 10.30 am - 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Differentiate between positive rake and negative rake in single point cutting tools. State the relative advantages and disadvantages of each of them. **05**
- (b)** Show, from the geometry of chip formation for a continuous type chip without built-up edge, that the shear plane angle θ is given by $\tan \theta = \frac{r_c \cos \gamma}{1 - r_c \sin \gamma}$, where r_c is the chip thickness ratio and γ is rake angle. State the assumptions made. What is the significance of chip thickness ratio? **05**
- (c)** The cutting speed and tool life relationship for a tool is given by $VT^{0.25} = C$. During turning of a 40 mm diameter bar on a lathe at a cutting speed of 150 m/min, the tool life is found to be 30 minutes. Calculate spindle speed to give a tool life of 60 min. **04**
- If length of each component to be turned is 200 mm, what is the cutting time per piece and how many pieces can be produced between tool changes at a feed of 0.15 mm/rev in each case i.e. tool life of 30 min. and 60 min?
- Q.2 (a)** During turning a steel rod of diameter 100 mm at a cutting velocity of 3 m/sec and depth of cut 4.0 mm by an insert tool with side rake angle 10° , the following observations were made under orthogonal cutting conditions: **07**
- Cutting force = 1500 N
Feed force = 800 N
Chip thickness before cut = 0.2 mm
Thickness of cut chip = 0.5 mm.
- With the help of Merchant Circle diagram, determine:
- (i) shear angle
 - (ii) forces exerted by the workpiece on the chip
 - (iii) forces exerted by the tool on the chip
 - (iv) friction angle, and
 - (v) total work done in cutting.
- (b)** How does Oblique cutting differ from Orthogonal cutting? **03**
- (c)** Enlist various types of drill jigs. With the help of neat sketches, explain any two types of drill jigs. **04**
- OR**
- (b)** Ceramic and cermet cutting tools have certain advantages over carbide tools. Why, then, are they not completely replacing carbide tools? **03**
- (c)** Explain (i) Renewable bushes, and (ii) Liner bushes used in drilling jigs. **04**
- Q.3 (a)** What are different causes or mechanisms of tool wear? Explain (with neat sketches) (i) Abrasion wear, and (ii) Adhesion wear. **05**
- (b)** How are unconventional machining methods classified? State the advantages and disadvantages of unconventional machining processes. **05**
- (c)** State the functions of electrolyte in ECM. What is a good electrolyte for ECM process? **04**

OR

- Q.3 (a)** Why is it necessary to control the temperature in the cutting zone? **05**
What are the basic functions of cutting fluids?
- (b)** Describe the Ultrasonic Machining (USM) process with neat sketch. **05**
Write the functions of slurry, horn, and transducer in USM.
- (c)** The following data were recorded while machining a 10 mm diameter circular hole in steel plate with an R-C type EDM circuit. **04**
Resistance $R = 10\ \Omega$
Capacitance $C = 10\ \mu\text{F}$
Supply voltage = 220 V
Assuming that the spark generator delivers maximum energy, calculate:
(i) Breakdown voltage
(ii) Charging time
(iii) Energy released per spark
(iv) Spark frequency.
- Q.4 (a)** With the help of suitable example, explain 3-2-1 location system. **05**
- (b)** Sketch and design a progressive die to produce washer of 25 mm diameter with 10 mm central hole from cold rolled steel sheet of 1.5 mm thickness. The ultimate shear strength of the material is $350\ \text{N/mm}^2$. Calculate: **05**
(i) Maximum punch force necessary to blank and punch the washer if both punches operate at the same time.
(ii) Punch and die size for punching and blanking operation.
- (c)** Differentiate between a Jig and a Fixture. **04**
- OR**
- Q.4 (a)** Using neat sketches explain the 3-2-1 location system for cylindrical shapes: **05**
(i) a long cylinder, and (ii) a short cylinder (length-to-dia. ratio less than one).
- (b)** Explain various modifications in punch and/or die that can be employed so as to reduce the punch force. **05**
- (c)** Draw neat schematic diagram of a sectioned view of a compound die and explain salient features of it. **04**
- Q.5 (a)** Explain, with the help of illustrative sketches, the principle of (i) Gear milling, and (ii) Gear shaping. **05**
- (b)** Explain different types of locators used in jigs and fixtures. **05**
- (c)** Write the differences between a Capstan and a Turret lathe. **04**
- OR**
- Q.5 (a)** Explain with the help of sketch, the principle of thread rolling. **05**
State the advantages and limitations of thread rolling.
- (b)** What is a transfer machine? Explain different types of transfer machines. **05**
- (c)** Prepare the tool layout for manufacturing a hexagonal headed bolt from a hexagonal bar stock on a capstan lathe. **04**
