

# POSTAL Book Package

# 2023

## GATE • PSUs

### PRODUCTION AND INDUSTRIAL ENGINEERING

#### Objective Practice Sets

#### Manufacturing Process-II

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## Introduction to Machine Tools

## MCQ and NAT Questions

- Q.1** Which of the following is included in basic machine tools?  
 (a) Lathe Machine  
 (b) Production Milling Machine  
 (c) Production Drilling Machine  
 (d) None of the above
- Q.2** Which type of machine tool is used for mass production of essentially small parts?  
 (a) General purpose  
 (b) Special purpose  
 (c) Automatic screw cutting  
 (d) None of the above
- Q.3** Machine tools can be classified on the basis of  
 (a) Geometric shape of the workpiece  
 (b) Number of workpiece  
 (c) Function of the machine  
 (d) All of the above
- Q.4** Which of the following formula is correct for calculating the maximum spindle speed ( $N_{\max}$ ) in machining process?  
 (a)  $N_{\max} = \frac{1000 V_{\max}}{\pi D_{\min}}$   
 (b)  $N_{\max} = \frac{1000 V_{\min}}{\pi D_{\max}}$   
 (c)  $N_{\max} = \frac{1000 V_{\max}}{\pi D_{\max}}$   
 (d)  $N_{\max} = \frac{1000 V_{\min}}{\pi D_{\min}}$
- where  $V$  is cutting speed in m/min and  $D$  is diameter in mm.
- Q.5** In a machine tool gear box, the smallest and largest speeds are 100 rpm and 1120 rpm respectively. If there are 8 speeds in all, the fourth speed will be

- (a) 400 rpm                      (b) 280 rpm  
 (c) 800 rpm                      (d) 535 rpm

## Multiple Select Questions (MSQ)

- Q.6** A comparator is a precision instrument used for  
 (a) Measurement of dimensions  
 (b) Compare dimensions with some working standards.  
 (c) It does not measure the dental dimension but it can indicate the deviation from basic dimensions  
 (d) It does not indicate the deviation from basic dimensions.
- Q.7** Which of the following instrument/s is/are used for angular measurements  
 (a) Sine bar                      (b) Clinometer  
 (c) Auto collimator          (d) Slip gauges
- Q.8** Which of the following instrument/s is/are used for measuring the straightness of a line  
 (a) Straight edge                (b) Spirit level  
 (c) Auto collimator          (d) Using Engineer's square
- Q.9** M 20 × 3.5 plug screw gauge was checked for effective diameter using floating carriage micrometer and readings were taken as below. Diameter of standard cylinder = 18.0010 mm, Micrometer reading over standard cylinder with two wires of same diameter = 15.6420 mm, Micrometer reading over the plug screw gauge with wire of same diameter was 15.2616 mm. Best wire size was chosen for measurement. Choose the correct option/s  
 (a) Effective diameter is 18.6309 mm  
 (b) Diameter of best wire size is 2.0207 mm  
 (c) Difference between size under wire and effective diameter is 1.0103 mm  
 (d) Effective diameter is 18.3422

**Q.10** The worktable of a positioning system is driven by a lead screw whose pitch is 2.1 mm. The lead is connected to output shaft of stepper motor through a gearbox whose ratio is 8 : 1. The stepper motor has 72 step angles. Then choose the correct option/s

- (a) step angle,  $\alpha = 5^\circ$
- (b) linear distance moved by table in 10 pulses is 0.0365 mm
- (c) linear distance moved by table in 10 pulses is 0.292 mm
- (d) Movement of lead screw in 10 pulse is  $50^\circ$



**Answers Introduction to Machine Tools**

1. (a)    2. (c)    3. (d)    4. (a)    5. (b)    6. (b, c)    7. (a, b, c)    8. (a, b, c)    9. (a, b, c)  
10. (a, b)

**Explanations Introduction to Machine Tools**

**1. (a)**  
According to the definition of basic types of machine tools, lathe is basic machine tool while production milling machine and production drilling machines are special machine tools.

**2. (c)**  
Automatic screw cutting is used for mass production of essentially small parts. It is used because of its high accuracy.

**3. (d)**  
These all are the aspects, which are responsible for the classification of machine tools.

**4. (a)**  
$$N_{\max} = \frac{1000 V_{\max}}{\pi D_{\min}}$$

**5. (b)**  
Given :  $N_{\max} = 1120 \text{ rpm}$ ,  
 $N_{\min} = 100 \text{ rpm}$ ,  
 $n = 8$   
$$\therefore r = \left( \frac{N_{\max}}{N_{\min}} \right)^{\frac{1}{n-1}} = \left( \frac{1120}{100} \right)^{\frac{1}{7}} = 1.41$$
  
Now,  $N_4 = N_{\min}(r)^{4-1} \Rightarrow 100 \times (1.41)^3$   
 $\Rightarrow N_4 = 280.32 \text{ rpm}$

**6. (b, c)**  
(b) and (c) are the use of a comparator.

**7. (a, b, c)**  
(a), (b) and (c) are used for angular measurements.

**8. (a, b, c)**  
(a), (b) and (c) are used for measuring straightness of line.

**9. (a, b, c)**  
Effective diameter of =  $T + P$   
$$T = S - (R_1 - R_2)$$
  
$$= 18.0010 - (15.6420 - 15.2616)$$
  
$$T = 17.6206 \text{ mm}$$

$d_b = \text{diameter of best wire size} = \frac{p}{2} \sec$   
$$= \frac{3.5}{2} \sec 30^\circ = 2.0207 \text{ mm}$$

Difference between size under wire and effective diameter,  $P = 0.866 p - d_b = 1.0103 \text{ mm}$   
Effective diameter =  $(17.6206 + 1.0103) \text{ mm}$   
$$= 18.6309 \text{ mm}$$

**10. (a, b)**  
Step angle,  $\alpha = \frac{360^\circ}{72} = 5^\circ$   
in 1 pulse stepper motor turns  $5^\circ$   
in 1 pulse lead screw moves by  $\frac{5^\circ}{8} = 0.625^\circ$   
linear distance moved by table in 1 pulse  
$$= \frac{0.625 \times 2.1}{360} = 3.65 \times 10^{-3} \text{ mm}$$
  
linear distance moved by table 10 pulse  
$$= 10 \times 3.65 \times 10^{-3} \text{ mm}$$
  
$$= 0.0365 \text{ mm}$$

