

Roll No.

Total Pages : 4

BT-3/D-12

8330

MATHEMATICS-III**Paper-MATH-201E**

Time Allowed : 3 Hours]

[Maximum Marks : 100

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT-I

1. (a) Obtain Fourier series expansion of

$$f(x) = \left(\frac{\pi - x}{2}\right)^2 \text{ for the range } (0 \text{ to } 2\pi).$$

- (b) Find Fourier series to represent $f(x)$ given by

$$f(x) = \begin{cases} 1 + \frac{2x}{\pi}, & -\pi \leq x \leq 0 \\ 1 - \frac{2x}{\pi}, & 0 \leq x \leq \pi \end{cases}$$

Deduce that

$$\sum_{n=1}^{\infty} \frac{1}{(2n-1)^2} = \frac{\pi^2}{8}.$$

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2. (a) Find Fourier transform of

$$f(x) = \begin{cases} x^2 & , |x| < a \\ 0 & , \text{otherwise.} \end{cases}$$

- (b) Use Fourier sine transform to solve the equation

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, \quad (x > 0, t > 0)$$

subject to the conditions :

(i) $u(0, t) = 0.$

(ii) $u(x, t)$ is bounded.

(iii) $u(x, 0) = \begin{cases} 1 & , 0 < x < 1 \\ 0 & , x \geq 1 \end{cases}$

UNIT-II

3. (a) If $f(z)$ is an analytic function with constant modulus, show that $f(z)$ is constant.

- (b) Find the regular function, whose imaginary part is

$$v = e^{-x}(x \sin y - y \cos y).$$

4. (a) Find the bilinear transformation which maps the points $z = -1, i, 1$ of the z -plane onto $w = 1, i, -1$ of the w -plane respectively.

- (b) Under the transformation $w = \frac{1}{z}$, find the image of

$$1Z - 2i \leq 2$$

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2

UNIT-III

5. (a) Let A and B be two events with their probabilities
 $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$ and $P(A \cap B) = \frac{1}{4}$. Find
 $P(A/B)$, $P(A \cup B)$ and $P(A' / B')$.
- (b) In a certain college, 4% of the boys and 1% of girls are taller than 1.8 m. Further more 60% of the students are girls. If a student is selected at random and is found to be taller than 1.8 m, what is the probability that the student is a girl ? <http://www.kuonline.in>
6. (a) If 10 percent of the rivets produced by a machine are defective, find the probability that out of 5 rivets chosen at random (i) none will be defective, (ii) one will be defective and (iii) atleast two will be defective.
- (b) For a normally distributed variate with mean 1 and S.D. 3, find the probabilities that :
- (i) $3.43 \leq x \leq 6.19$, (ii) $-1.42 \leq x \leq 6.18$.

UNIT-IV

7. (a) Using graphical method, solve
 $\text{Min } Z = 20x + 30y$
 subject to $x + 2y \leq 40$, $2x + y \leq 30$,
 $4x + 3y \geq 60$, $x, y \geq 0$.

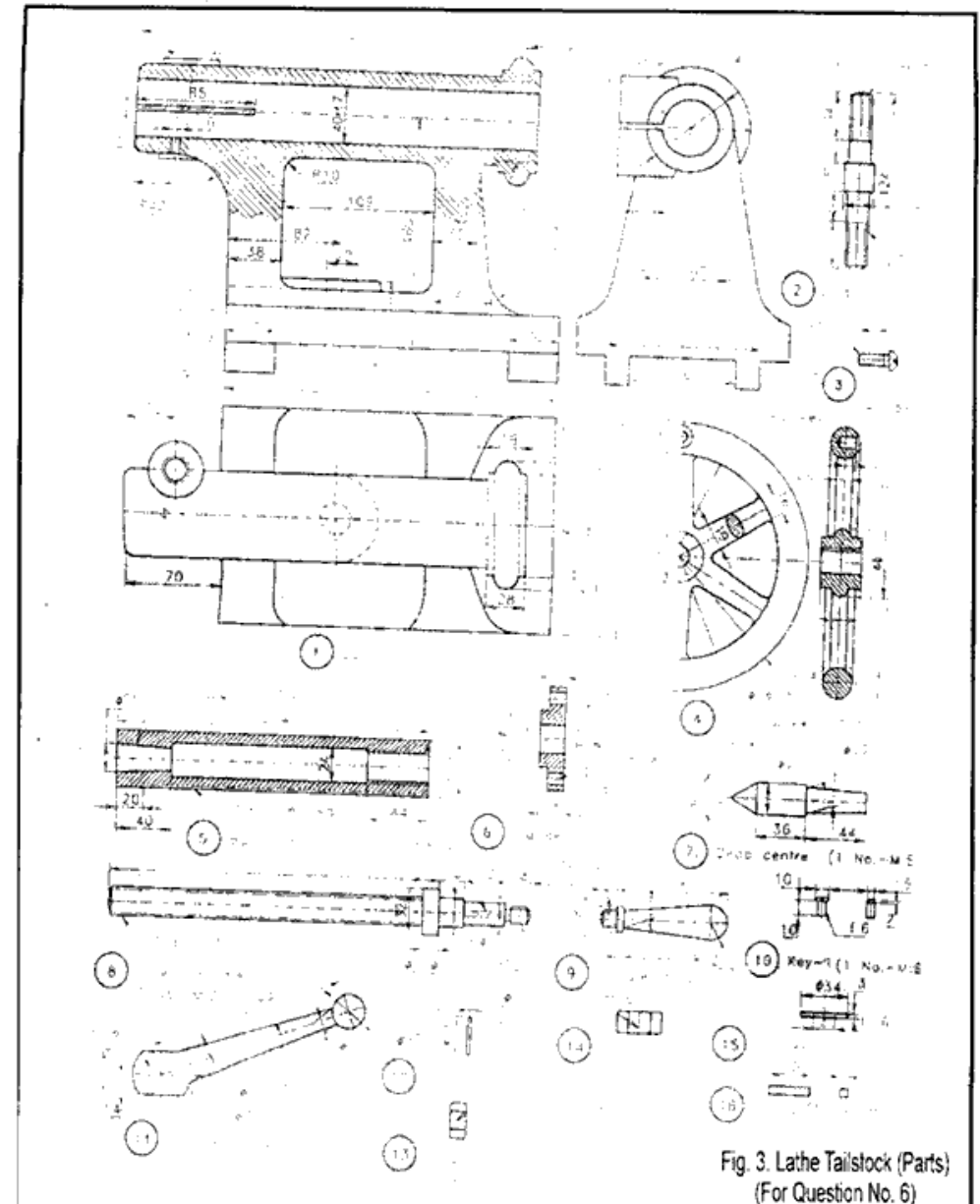


Fig. 3. Lathe Tailstock (Parts)
 (For Question No. 6)