3/12/18
9.30 - 12.30

Roll No. .....

# TMA–301

## B. TECH. (ELECTRICAL ENGINEERING) (THIRD SEMESTER) END SEMESTER EXAMINATION, 2018

### ENGINEERING MATHEMATICS—III

**Time : Three Hours**

**Maximum Marks : 100**

**Note :** (i) This question paper contains two Sections.

(ii) Both Sections are compulsory.

**Section—A**

1. Fill in the blanks : (1×5=5 Marks)

   (a) If $F\{f(x)\} = F(s)$, then $F\{x^n f(x)\} =$ ..... .

   (b) If A and B are two events such that $P(A) = 0.5$, $P(B) = 0.6$ and $P(A \cup B) = 0.8$, then $P(A|B)$ is ..... .

   (c) The value of the integral $\int_C \frac{dz}{z-5} =$ ..... (where C is the circle $|z| = 4$).

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(d) The mean and variance of the standard normal variable $z = \frac{X - \mu}{\sigma}$ for normal distribution are ..... and ..... respectively.

(e) Write down the normal equations for a parabola $y = a + bx$ for $n$ pair of points .....

2. Attempt any *five* parts out of seven : (3×5=15 Marks)

(a) Consider a sequence of tossing of a fair coin where the outcomes of tosses are independent. Find the probability of getting the head for third time in the fifth toss.

(b) The first three moments about mean of the distribution 5, 15, 20.

(c) Calculate the mean of the distribution 5, 7, 10, 13, 15.

(d) Find the value of integral $\int_C \frac{3z^2 + 7z + 1}{z + 1} dz$, where C is the circle $|z| = \frac{1}{2}$.





(e) Find the residue of $f(z) = \frac{ze^z}{(z-a)^3}$ at its pole.

(f) Find the inverse Z-transform of $F(z) = \frac{1}{z^2 - 1}$.

(g) Find the Z-transform of sinusoidal function :

$$p(x) = \begin{cases} a^n; & n \geq 0 \\ 0; & n < 0 \end{cases}$$

**Section—B**

3. Attempt any *two* parts of choice from (a), (b) and (c). (10×2=20 Marks)

(a) Find the Fourier transform of the following function :

$$f(x) = \begin{cases} 1 - x^3, & \text{for } -1 \leq x \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

(b) Find the bilinear transformation which maps the points $z = 0, 1, -1$ into the points $w = -i, 0, i$.

(c) The following are measurements of air velocity ($x$) and evaporation coefficient ($y$)

of burning fuel droplets in an impulse engine :

| $x$ | $y$ |
|---|---|
| 20 | 0.18 |
| 60 | 0.37 |
| 100 | 0.35 |
| 140 | 0.78 |
| 180 | 0.56 |
| 220 | 0.75 |
| 260 | 1.18 |
| 300 | 1.36 |
| 340 | 1.17 |
| 380 | 1.65 |

Fit an exponential curve $y = ax^b$ to the above data.

4. Attempt any *two* parts of choice from (a), (b) and (c). (10×2=20 Marks)

(a) If $p(x) = \begin{cases} \frac{x}{6}; & x = 1, 2, 3 \\ 0, & \text{elsewhere} \end{cases}$, then find the probability of P (X = 3).





(b) Fit a parabola $y = ax^2 + bx + c$, by the method of least square :

| $x$ | $f(x)$ |
|---|---|
| 1 | 5 |
| 2 | 12 |
| 3 | 26 |
| 4 | 60 |
| 5 | 97 |

(c) The mean and variance of a binomial variate X with parameters $n$ and $p$ are 16 and 8. Find :

(i) P (X = 0)

(ii) P (X = 1)

(iii) P (X ≥ 2)

5. Attempt any *two* parts of choice from (a), (b) and (c). (10×2=20 Marks)

(a) Fit a parabolic curve of regression of $y$ on $x$ to the following data :

| $x$ | $f(x)$ |
|---|---|
| 1.0 | 1.1 |
| 1.5 | 1.3 |
| 2.0 | 1.6 |
| 2.5 | 2.0 |
| 3.0 | 2.7 |
| 3.5 | 3.4 |
| 4 | 4.1 |

(b) Fit a curve $y = ax^2 + b$ for the following data :

| $x$ | $y$ |
|---|---|
| 12 | 6.44 |
| 16 | 7.5 |
| 20 | 6.9 |
| 22 | 10.76 |
| 24 | 10.76 |

(c) If $P(x) = \begin{cases} \frac{x}{10}; & x = 1, 2, 3, 4 \\ 0; & \text{elsewhere} \end{cases}$

Find :

(i) $P\{X = 2 \text{ or } 3\}$

(ii) $P\left\{\frac{1}{2} < X < \frac{7}{2}\right\}$.

6. Attempt any *two* parts of choice from (a), (b) and (c). (10×2=20 Marks)

(a) Find the inverse Z-transform of $F(z) = \frac{2z^2 + 3z}{(z+2)(z-4)}$.

(b) Define analytic function. Show that the function $f(z) = z|z|$ is not analytic anywhere.

(c) Solve the equation $x^3 - 18x - 35 = 0$ by using Cardon method.