Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐   **Total No. of Pages : 03**

Total No. of Questions : 18

B.Tech.(ECE) (2018 Batch)   (Sem.–3)
MATHEMATICS III
Subject Code : BTAM-303-18
M.Code : 76448

Time : 3 Hrs.   **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

Write briefly :

1. If a random variable has a Poisson distribution such that $P(1) = P(2)$. Find the mean of the distribution.

2. Find the Laplace transform of $t^3 e^{-3t}$.

3. Represent $f(t) = \sin 2t$, $2\pi < t < 4\pi$ and 0 otherwise, in terms of unit step function.

4. State convolution theorem of Fourier transform.

5. Find the Z-transform of $e^t \sin 2t$.

6. Write the relation between Fourier and Laplace transforms.

7. Define discrete and continuous random variables.

8. Define Rank correlation.

9. State initial and final value theorems of Z-transform.

10. Define Binomial and Poisson distribution functions.

SECTION-B

11. Evaluate :

$$L \left\{ e^{-t} \int_0^t \frac{\sin t}{t} \, dt \right\}$$

12. Find the Fourier transform of :

$$e^{-2(x-3)^2}$$

13. Using the Z-transform, solve :

$$u_{n+2} + 4u_{n+1} + 3u_n = 3^n$$

with $u_0 = 0$, $u_1 = 1$.

14. The two regression equations of the variables x and y are $x = 19.13 - 0.87 \, y$ and $y = 11.64 - 0.50 \, x$. Find (i) mean of x and y (ii) the correlation co-efficient between x and y.

15. The intelligence quotients (IQ) of 16 students from B. Tech. IInd year showed a mean of 107 and a standard deviation of 10, while the IQs of 14 students from B. Tech. 1st year showed a mean of 112 and a standard deviation of 8. Is there a significant difference between the IQs of the two groups at significance levels of 0.05? Given that critical value at 28 degree of freedom with 5% level of significance is 2.05.

SECTION-C

16. a) Apply Convolution theorem to evaluate

$$L^{-1} \left[\frac{1}{(s^2 +1)(s^2 +9)} \right]$$

b) Find the inverse Laplace transform of

$$\frac{se^{-s/2} + \pi e^{-s}}{s^2 + \pi^2}$$

17. If $f(x) = \sin x$, $0 \le x \le \pi$ and $f(x) = 0$, $-\pi \le x \le 0$, Prove that

$$f(x) = \frac{1}{\pi} + \frac{\sin x}{2} - \frac{2}{\pi} \sum_{n=1}^{\infty} \frac{\cos 2nx}{4n^2 - 1}$$

Hence show that :

$$\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \dots - \infty = \frac{\pi - 2}{4}$$

18. Find the coefficient of correlation and obtain the lines of regression from the given data

X	62	64	65	69	70	71	72	74
Y	126	125	139	145	165	152	180	208

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.