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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

1. Write briefly :

a) In Poisson frequency distribution, frequency corresponding to 3 successes is 2/3 times frequency corresponding to 4 successes. Find the standard deviation of the distribution.

b) Find the Z-transform of $e^t \sin 2t$

c) Find the Laplace transform of $t^2 \sin t$

d) Define Binomial and Poisson distribution functions.

e) Define Rank correlation.

f) Define the Laplace and Fourier transforms.

g) Define unit-step and dirac delta functions.

h) Define discrete and continuous random variables.

i) State convolution theorem of Fourier transform.

j) Given that $f(x)=k\left(\frac{1}{2}\right)^x$, is a probability distribution for a random variable which can take on its values $x = 0, 1, 2, 3, 4, 5, 6$. Find k.

SECTION-B

2. Use Laplace transform method to solve

$$\frac{d^2x}{dt^2} - \frac{2dx}{dt} + x = e^t$$

with $x = 2$, $\frac{dx}{dt} = -1$ at $t = 0$.

3. Find the Fourier sine transform of $e^{-|x|}$. Hence show that :

$$\int_0^\infty \frac{x \sin mx}{1+x^2} dx = \frac{\pi e^{-m}}{2}, \quad m > 0$$

4. If $$U(z) = \frac{2z^2 + 5z + 14}{(z-1)^4}$$

Evaluate u_2 and u_3.

5. The theory predicts the proportion of beans, in the four groups A, B, C and D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory? (The table value of χ^2 for 3 d.f. at 5% level of significance is 7.81).

6. The two regression equations of the variables x and y are $x = 19.13 - 0.87y$ and $y = 11.64 - 0.50x$. Find

(i) mean of x and y

(ii) the correlation co-efficient between x and y.

SECTION-C

7. Find the Fourier cosine series of the function $f(x) = \pi - x$ in $0 < x < \pi$. Hence show that

$$\sum_{r=0}^{\infty} \frac{1}{(2r+1)^2} = \frac{\pi^2}{8}$$

8. a) Marks obtained by a number of students are assumed to be normal distributed with mean 50 and variance 36. If 4 students are taken at random, what is the probability that exactly two of them will have marks over 65? Given that $\int_0^2 \Phi(z)\,dz = 0.4772$ where Z is N (0, 1).

b) Fit the second degree parabola to the following data :

X	0	1	2	3	4
Y	1	1.8	1.3	2.5	6.3

9. From the given data, find (*i*) the two regression equations, (*ii*) the coefficient of correlation between the marks in Mathematics & Statistics, and (*iii*) the most likely marks in Statistics when the marks in Mathematics are 30.

Marks in Mathematics	25	38	35	32	31	36	29	38	34	32
Marks in Statistics	43	46	49	41	36	32	31	30	33	39

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.