Roll No. | | | | | | | | | | | | |  Total No. of Pages : 02

Total No. of Questions : 18

B.Tech. (Computer Science Engineering / Information Technology / ECE) (Sem.–4)

# MATHEMATICS –III / ENGINEERING MATHEMATICS –III

Subject Code : BTCS402

M.Code : 56605

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) Define periodic functions.

2) State the sufficient condition for the existence of Laplace transforms.

3) Define analytic and conjugate functions of a complex variable.

4) Define Homgenous linear partial differential equation.

5) Define critical region of the testing.

6) Define Eigen value and eigen vector of a matrix.

7) Define Binomial and Poisson distributions.

8) Write the Laplace transform of $t^2 \sin 2t$.

9) Write the difference between chi-square and $t$-distributions.

10) Differentiate between Euler's and modified Euler's method for solving the ordinary differential equation.

## SECTION-B

11) Obtain the Fourier series of $x \sin x$ as a cosine series in $(0, \pi)$. Hence show that $\frac{1}{1.3}-\frac{1}{3.5}+\frac{1}{5.7}-\ldots\ldots\infty=\frac{\pi-2}{4}$.

12) Using the Laplace transform, prove that

$$\int_0^\infty \frac{e^{-at} - e^{-bt}}{t} dt = \log \frac{b}{a}.$$

13) Solve the following equation by Gauss elimination method :

$$2x + y + z = 10 \; ; \; 3x + 2y + 3z = 18 \; ; \; x + 4y + 9z = 16$$

14) 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 $\chi^2$ for 3 d.f. at 5% level of significance is 7.81).

15) Show that $f(z) = xy^2 (x + iy) + (x^2 + y^4)$, $z \neq 0$ and $f(z) = 0$, $z = 0$ is not analytic at $z = 0$, although C-R equations are satisfied at the origin.

## SECTION-C

16) 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) 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. Ist 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 of 28 degree of freedom with 5% level of significance is 2.05.

17) Find the largest eigen value and the corresponding eigen vector of the matrix

$$\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}.$$

18) Solve the following by Euler's modified method :

$$\frac{dy}{dx} = x + y, \; y(0) = 1$$

at $x = 0.3$ with step size 0.1.

**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.**