A   **E4801**

Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FOURTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018
Course Code: MA202
Course Name: PROBABILITY DISTRIBUTIONS, TRANSFORMS AND NUMERICAL METHODS

Max. Marks: 100   Duration: 3 Hours

(Normal distribution table is allowed in the examination hall)

PART A (MODULES I AND II)
Answer any two full questions, each carries 15 marks   Marks

1 a) Derive the formula for mean and variance of Binomial distribution.   (7)
   b) 100 fair dice are thrown. Find the expectation of the sum of the numbers thrown.   (8)
2 a) A continuous random variable X has a pdf $f(x) = kx^2 e^{-x}; x \geq 0$.   (7)
       Find   i) Value of k   and   ii) Mean of the distribution.
   b) If X is a uniformly distributed $R\,V$ with mean 1 and variance $\frac{4}{3}$, find $P(|X-2|<2)$ (8)
3 a) The time in hours required to repair a machine is exponentially distributed with mean 20. What is the Probability that the required time :   (7)
           i) Exceeds 30 hrs   ii) Between 16 hrs and 24 hrs.
   b) Marks of a set of students for a certain subject are approximately normally distributed with mean 62 and variance 9. If 4 students are randomly selected, what is the probability that 3 of them have less than 60 marks?   (8)

PART B (MODULES III AND IV)
Answer any two full questions, each carries 15 marks

4 a) Find the Fourier Integral representation of $f(x) = \begin{cases} 1 & if \ |x| < 1 \\ 0 & if \ |x| > 1 \end{cases}$ (7)
   b) Find the Fourier Sine Transform of $f(x) = e^{-|x|}$. Hence evaluate $\int_0^\infty \frac{\omega \sin \omega x}{1+\omega^2}\, d\omega$.   (8)
5 a) Find the Laplace Transform of :   (7)
           $(i)\ sin3t \cos 2t$ $(ii)\ e^{-2t} cos^2 t$
   b) Find the Inverse Laplace Transform of: (8)
           $(i)\ \frac{S-4}{S^2-4}$ $(ii)\ \frac{4}{S^2-2S-3}$
6 a) Find the Fourier Cosine Transform of $f(x) = \sin x ;\ \ 0 < x < \pi$.   (7)
   b) Solve, by using Laplace Transform: $y'' + y = 3\,cos\,2t;\ y(0) = 0, y'(0) = 0$.   (8)

PART C (MODULES V AND VI)
Answer any two full questions, each carries 20 marks

7 a) Find a root lying between 0 and $\frac{\pi}{2}$ of $f(x) = \cos x - 3x + 1 = 0$. (correct to 3 decimal places).   (6)
   b) Using Lagrange's interpolation formula, fit a polynomial to the given data and hence find $y(2)$ (7)

x	1	3	4
y	1	27	64

c) Using Newton's Forward Interpolation Formula, find the value of $\sin 52°$ given that (6)
$\sin 45° = 0.7071, \sin 50° = 0.7660, \sin 55° = 0.8192, \sin 60° = 0.8660,$
$sin65° = 0.9063.$

8 a) Solve the following equations by Gauss- Seidel iteration Method. (correct to 3 (7)
decimal places).

$$27x + 6y - z = 85, \ 6x + 15y + 2z = 72, \ x + y + 54z = 110.$$

b) Use Euler's Method with $h = 0.025$, compute the value of $y(0.1)$ for (7)

$$y' = x - y^2; \ y(0) = 1.$$

c) A river is 80m wide. The depth y in meters at a distance x meter from one bank is (6)
given by the following table.

x	0	10	20	30	40	50	60	70	80
y	0	5	8	10	15	12	7	3	1

Find approximately the area of cross section using Simpson's $1/3$ rd rule.

9 a) Using Newton-Raphson Method, derive a formula to find $\sqrt[3]{N}$ where N is a real (10)
number. Hence evaluate $\sqrt[3]{35}$ correct to three decimal places.

b) Using Runge- Kutta Method of Fourth Order, $\frac{dy}{dx} = \sqrt{x+y}; \ y(0) = 1$, find $y(0.2)$ (10)
with $h = 0.1$

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