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## 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) <br> 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.
b) 100 fair dice are thrown. Find the expectation of the sum of the numbers thrown.

2 a) A continuous random variable X has a pdf $f(x)=k x^{2} e^{-x} ; x \geq 0$.
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 $P(|X-2|<2)$

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 :
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?

## PART B (MODULES III AND IV)

## Answer any two full questions, each carries 15 marks

4 a) Find the Fourier Integral representation of $f(x)= \begin{cases}1 & \text { if }|x|<1 \\ 0 & \text { if }|x|>1\end{cases}$
b) Find the Fourier Sine Transform of $f(x)=e^{-|x|}$. Hence evaluate $\int_{0}^{\infty} \frac{\omega \sin \omega x}{1+\omega^{2}} d \omega$.

5 a) Find the Laplace Transform of :
(i) $\sin 3 t \cos 2 t$
(ii) $e^{-2 t} \cos ^{2} t$
b) Find the Inverse Laplace Transform of:
(i) $\frac{S-4}{S^{2}-4}$
(ii) $\frac{4}{S^{2}-2 S-3}$

6 a) Find the Fourier Cosine Transform of $f(x)=\sin x$; $0<x<\pi$.
b) Solve, by using Laplace Transform: $y^{\prime \prime}+y=3 \cos 2 t ; y(0)=0, y^{\prime}(0)=0$.

## 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 $f(x)=\cos x-3 x+1=0$. (correct to 3 decimal places).
b) Using Lagrange's interpolation formula, fit a polynomial to the given data and hence find $y(2)$

| $\mathbf{x}$ | 1 | 3 | 4 |
| :---: | :---: | :---: | :---: |
| $\mathbf{y}$ | 1 | 27 | 64 |

c) Using Newton's Forward Interpolation Formula, find the value of $\sin 52^{\circ}$ given that
$\sin 45^{\circ}=0.7071, \sin 50^{\circ}=0.7660, \sin 55^{\circ}=0.8192, \sin 60^{\circ}=0.8660$, $\sin 65^{\circ}=0.9063$.
8 a) Solve the following equations by Gauss- Seidel iteration Method. (correct to 3 decimal places).

$$
\begin{equation*}
27 x+6 y-z=85,6 x+15 y+2 z=72, x+y+54 z=110 . \tag{7}
\end{equation*}
$$

b) Use Euler's Method with $h=0.025$, compute the value of $y(0.1)$ for $y^{\prime}=x-y^{2} ; \quad y(0)=1$.
c) A river is 80 m wide. The depth $y$ in meters at a distance $x$ meter from one bank is given by the following table.

| $\mathbf{x}$ | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{y}$ | 0 | 5 | 8 | 10 | 15 | 12 | 7 | 3 | 1 |

Find approximately the area of cross section using Simpson's $1 / 3 \mathrm{rd}$ rule.
9 a) Using Newton-Raphson Method, derive a formula to find $\sqrt[3]{N}$ where $N$ is a real number. Hence evaluate $\sqrt[3]{35}$ correct to three decimal places.
b) Using Runge- Kutta Method of Fourth Order, $\frac{d y}{d x}=\sqrt{x+y} ; y(0)=1$, find $y(0.2)$ with $h=0.1$

