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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FOURTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019
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 two full questions.

1   a) The following table gives the probability that a certain computer will malfunction

0, 1, 2, 3, 4, 5, or 6 times on any one day

Number of Malfunctions x	0	1	2	3	4	5	6
Probability f(x)	0.17	0.29	0.27	0.16	0.07	0.03	0.01

(7)

Find (i) The Mean, Variance and Standard Deviation of this probability distribution

(ii) $P(0<x<5)$ (iii) $P(x>4)$

b) It is known that 5% of the books bound at a certain bindery have defective bindings. Find the probability that atmost 2 of 100 book bound by this bindery will have defective binding using

(i)   The formula for binomial distribution

(ii)   Poisson approximation to the binomial distribution

(8)

2   a) Derive the mean, variance and distribution function of the uniform distribution in the interval (a,b).

(7)

b) The amount of time that a surveillance camera will run without having to be reset is a random variable having the exponential distribution with mean 50 days.

Find the probability that such a camera will

(i)   have to be reset in less than 20 days

(ii)   not have to be reset in at least 60 days

(iii)   have to be reset between 20 and 60 days.

(8)

3   a) The time required to microwave a bag of popcorn using the automatic setting can be treated as a random variable having a normal distribution with standard deviation 10 seconds. If the probability is 0.8212 that the bag will take less than 282.5 seconds to pop, find the probability that it will take longer than 258.3 seconds to pop.

(7)

b) Prove that binomial distribution with parameters n and p can be approximated to Poisson distribution when n is large and p is small with $np = \lambda$, a constant.   (8)

PART B (MODULES III AND IV)
Answer two full questions.

4 a) Use Fourier integral to show that $\int_0^\infty \dfrac{cosx\omega + \omega sinx\omega}{1+\omega^2} d\omega = \begin{cases} 0 & if\ x < 0 \\ \pi/2 & if\ x = 0 \\ \pi e^{-x} & if\ x > 0 \end{cases}$ (7)

b) Find the Fourier Sine and Cosine Transform of $f(x) = \begin{cases} x^2 & if\ 0 < x < 1 \\ 0 & if\ \quad x > 1 \end{cases}$ (8)

5 a) Find the Laplace Transform of :

    (i) $e^{-t} \sin 3t \cos 2t$

    (ii) $t^2 \cos \omega t$ (7)

    (iii) $t^2 u(t-1)$

b) Find the inverse Laplace Transform of :

    (i) $\dfrac{1-7s}{(s-3)(s-1)(s+2)}$

    (ii) $\ln\dfrac{s-a}{s-b}$ (8)

    (iii) $\dfrac{e^{-3s}}{(s-1)^3}$

6 a) Find the Fourier Sine Transform of $f(x) = e^{-|x|}$. Hence evaluate $\int_0^\infty \dfrac{\omega sinx\omega}{1+\omega^2} d\omega$.   (7)

b) Solve by using Laplace Transform: $y'' + 2y' - 3y = 6e^{-2t}, y(0) = 2, y'(0) = -14$ (8)

PART C (MODULES V AND VI)
Answer two full questions.

7 a) Find the positive solution of $2\sin x = x$ using Newton Raphson (method correct to five decimal places).   (6)

b) Find the value of $\tan 33^0$ by using Lagrange's formula for interpolation   (7)

X	30^0	32^0	35^0	38^0
tan x	0.5774	0.6249	0.7002	0.7813

c) A second degree polynomial passes through the points (1,-1) (2,-1) (3, 1) (4, 5). Find the polynomial $f(x)$, Also find $f(1.2)$.   (7)

8 a) A river is 80 metre wide. The depth y in metres at a distance x metres from one

bank is given by the following table. Find approximately the area of cross section.

(6)

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

b) Using Improved Euler method find y at x = 0.1 and x = 0.2 for the equation (7)

$y' = y - \frac{2x}{y}, y(0) = 1.$

c) Solve the initial value problem $y' + y\, tanx = sin2x, y(0) = 1$ at $x =0.2$ using (7)
Runge- Kutta method.

9 a) Solve the following system of equations using Gauss elimination method.
$$10x + y + z = 6$$
$$x + 10y + z = 6$$
$$x + y + 10z = 6$$

(6)

b) Solve the system of equations using Gauss Seidel iteration method starting with (7)
the initial approximation x = y = z = 1.
$$4x + 5z = 12.5$$
$$x + 6y + 2z = 18.5$$
$$8x + 2y + z = -11.5$$

c) The population of a town is as follows

Year (x)	1941	1951	1961	1971	1981	1991
Population in lakhs(y)	20	24	29	36	46	51

(7)

Find the population increase during the period from 1946 to 1976