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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FOURTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019
Course Code: MA206
Course Name: PROBABILITY & STATISTICS AND NUMERICAL METHODS

Max. Marks: 100   Duration: 3 Hours
Statistical table is permitted inside the examination hall
PART A
Answer any two full questions, each carries 15 marks.   Marks

1 a) If the probability density of a random variable is given by   (8)

$$f(x) \begin{cases} x & for \ \ 0 < x < 1 \\ 2 - x & for \ \ 1 \le x < 2 \\ 0 & elsewhere \end{cases}$$

find the probabilities that a random variable having this probability density will take on a value
   i)   Between 0.2& 0.8
   ii)   Between 0.6& 1.2
   iii)   Find the distribution function

   b) Show that for a Poisson distribution with parameter λ (7)

   mean = variance = λ

2 a)   The Probability that a noise level of a wide band amplifier will exceed 2dB is 0.05. Find the probability that among 12 such amplifiers the noise level for   (8)
   i)   One will exceed 2 dB
   ii)   At most 2 will exceed 2 dB
   iii)   Two or more will exceed 2dB

   b) The burning time of an experiment rocket is a random variable having the normal distribution with mean 4.76 seconds and standard deviation 0.04 second. What is the probability that this kind of a rocket will burn in   (7)
   i)   Less than 4.66 seconds
   ii)   More than 4.80 seconds
   iii)   Anywhere from 4.70 to 4.80 seconds

3 a) The mileage which a car owner gets with certain kind of tyre is a random variable having an exponential distribution with mean 40,000 km. Find the probabilities that one of these tyres will last   (8)
   i)   At least 30,000 km
   ii)   At most 35,000 km

   b) The probability of getting 0,1,2,3,4 or 5 heads in five flips of a balanced coin are   (7)
   1/32, 5/32, 10/32, 5/32, 1/32 .Find the mean and variance.

PART B
Answer any two full questions, each carries 15 marks.

4 a) A random sample is taken from a normal population with mean 30 and standard (7)
       deviation 4. How large a sample should be taken if sample mean lie between 25
       and 35 with probability 0.98

   b) In 64 randomly selected hours of production, the mean and the standard deviation (8)
       of the number of acceptable pieces produced by an automatic stamping machine
       are $\overline{X} = 1038$ and s = 146. At 0.05 level of significance, does this enable us to
       reject the null hypothesis $\mu=1000$ against the alternate hypothesis $\mu > 1000$

5 a) In an air pollution study performed at an experiment station the following amount (8)
       of suspended benzene soluble organic matter (in microgram per cubic meter) was
       obtained from 8 different samples of air 2.2, 1.8, 3.1, 2.0, 2.4, 2.0, 2.1,1.2.
       Assuming that the population sample is normal , construct a 95% confidence
       interval for the corresponding population mean

   b) The means of two random samples of size 1000 and 2000 are 67.5 and 68 inches (7)
       respectively. Can the samples be regarded to have been drawn from the same
       population of standard deviation 9.5 inches ? Test at 5% level of significance.

6 a) If 2 independent random samples of size, $n_1 = 7 , n_2 = 13$ are taken from a (7)
       normal population. what is the probability that the variance of 1st sample will be
       at least 3 times as large as that of 2nd sample

   b) Define P- value. Suppose that we went to test on the basis of n=35 determinants (8)
       and at the 0.05 level of significance, whether the thermal conductivity of a certain
       kind of brick is 0.340 as claimed by a firm. From the information gathered in
       similar studies, we can expect that the variability of such determinations is to be
       $\sigma = 0.01$ and suppose that the mean of 35 determinations is 0.343. Test the claim

PART C
Answer any two full questions, each carries 20 marks.

7 a) Find the positive solution of 2 sin x = x by using Newton Raphson method ,the (6)
       solution is near to 2 (correct to 4D) .

   b) Using Lagrange's formula for interpolation find the value of y when x = 10 for the (7)
       following table .

x	5	6	9	11
y	12	13	14	16

   c) Using Gauss Seidal iteration method , solve (7)

$27x_1 + 6x_2 - x_3 = 85$, $6x_1 + 15x_2 + 2 x_3 = 72$, $x_1 + x_2 + 54x_3 = 110$

8 a) Solve $\frac{dy}{dx} = x - y^2$, $y(0) = 1$ by Euler method to find y(0.1) with h = 0.025.   (7)

   b) Evaluate $\int_1^2 \log x$ dx by Trapezidal rule with 5 equal parts .   (6)

   c) For the following data calculate the value of y when x = 9 using suitable interpolation formula .   (7)

x	8	10	12	14	16	18
y	10	19	32.5	54	89.5	154

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

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 .

   b) Using Runge kutta method of order 4 , Evaluate y (0.2) , given   (7)

   $\frac{dy}{dx} = x^2 + y^2$, y(0) = 1 use h = 0.2.

   c) Solve f(x) = x − 0.5 cos x = 0 near x = 0 by fixed point iteration method .   (7)