

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S,FE) (FT/WP/S2PT) Examinations May 2026 (2019 Scheme)



Course Code: MAT202

Course Name: PROBABILITY, STATISTICS AND NUMERICAL METHODS

Max. Marks: 100

Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks)

Marks

- 1 The mean and variance of binomial distribution are 16 and 8 respectively. Find $P(X = 0)$. (3)

- 2 A random variable has the following probability distribution. (3)

x	-2	-1	0	1	2	3
$p(x)$	0.1	k	0.2	2k	0.3	3k

Find the value of k and $P(X < 2)$.

- 3 If X is uniformly distributed in $-2 \leq x \leq 2$. Find $P(X < 1)$. (3)

- 4 A continuous random variable X has the pdf $f(x) = \begin{cases} k(1+x), & \text{if } 2 \leq x \leq 5 \\ 0, & \text{otherwise} \end{cases}$. (3)

Find (i) k (ii) $P(X < 4)$.

- 5 The mean volume of the liquid in bottles should be at least 4 liters. A sample bottles (3)
is taken in order to test whether the mean volume has fallen below 4 liters. Give a
null and alternative hypothesis for this test and specify whether test would be one
tailed or two tailed

- 6 The mean value of a random sample of 60 items was found to be 145, with a (3)
standard deviation of 40. Find the 95% confidence limits for the population mean.

- 7 Use Regula Falsi method to find an approximate root of the equation (3)

$$x^3 - 4x + 1 = 0, \text{ in two steps.}$$

- 8 Compute $\int_0^2 f(x) dx$ using Trapezoidal rule for the following data. (3)

x	0	0.5	1.0	1.5	2.0
$f(x)$	0.2	0.24	0.15	0.11	0.087

- 9 Find an approximate value of y when $x = 1.1$ for $\frac{dy}{dx} = 3x + y^2$, $y(1) = 1.2$ using (3)
second order R K method. (Use $h = 0.1$).

- 10 Using Euler's method, find an approximate value of y corresponding to $x = 1.2$, (3)
 given $\frac{dy}{dx} = x + 2y$, $y(1) = 1$ in steps of 0.1.

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

- 11 a) Out of 800 families with 4 children each, how many would be expected to have (i) (7)
 2 boys and 2 girls (ii) at least one boy (iii) no girl.
 b) Show that Poisson distribution is a limiting case of binomial distribution. (7)
- 12 a) If a publisher of nontechnical books takes great pain to ensure that its books are (7)
 free of typographical errors, so that the probability of any given page containing
 at least one such error is 0.005 and errors are independent from page to page. What
 is the probability that one of its 400 page novel will contain (i) exactly one page
 with error (ii) at most 3 pages with errors.
 b) The joint pmf of random variables X and Y is given by $p(x, y) = \frac{2x+y}{27}$ (7)
 $x = 0, 1, 2; y = 0, 1, 2$. Find (i) Marginal distributions of X and Y (i) Are X and Y
 independent.

Module -2

- 13 a) The diameter of an electric cable X is assumed to be a continuous random variable (7)
 with $f(x) = \begin{cases} 6x(1-x), & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$
 (i) Check whether $f(x)$ is a pdf. (ii) Find CDF of X . (iii) Find $P\left(X \leq \frac{1}{2}\right)$
 b) In a distribution exactly normal 7% of the items are under 35 and 89% are under (7)
 63. Find the mean and standard deviation of the distribution.
- 14 a) Let X be the time between two successive arrivals at drive-up window of a local (7)
 bank. If X has an exponential distribution with $\lambda = 1$, then compute the following
 (i) $P(X \leq 4)$ (ii) $P(2 \leq X \leq 5)$.
 b) The joint pdf of two dimensional random variables X and Y is given by $f(x, y) =$ (7)
 $\begin{cases} c, & 1 < x < 3, 2 < y < 4 \\ 0, & \text{otherwise} \end{cases}$
 Find (i) c (ii) $P(1 < x < 2, 3 < y < 4)$ (iii) $P(x+y \leq 5)$

Module -3

- 15 a) The average marks scored by 32 boys is 72 with a standard deviation of 8, while (7)
 that for 36 girls is 70 with a standard deviation of 6. Test at 1% level of significance
 whether the boys perform better than girls?

- b). On inspection of random sample of 500 items produced by a machine 30 were found to be defective. Does this justify the assumption that the machine is producing 2% defective items? (use $\alpha = 5\%$). (7)

- 16 a) A machine is designed to produce insulating washers for electrical devices of an average thickness of 0.025 cm. A random sample of 10 washers were found to have an average thickness of 0.024 cm with a SD of 0.002 cm. Test the significance of deviation at 1% level. (7)

- b) The mean life of certain products is 1800 hrs with SD of 100 hrs. By applying a new technique, it is claimed that the mean life has increased. To test the claim a sample of 50 products were taken and it is found that the mean life time is 1850 hrs. Can we support the claim at 1% level of significance? (7)

Module -4

- 17 a) Evaluate $\sqrt{12}$ using Newton- Raphson method correct to 4 decimal places. (7)
- b) Evaluate $\int_0^1 e^x dx$ using Simpson's rule, take $h=0.1$. (7)
18. a) Fit a polynomial of degree three which takes the following values, using Newton's forward difference formula. (7)

x	3	4	5	6
y	6	24	60	120

- b) Apply Lagrange's interpolation method to find the value of y when $x=10$ from the given table. (7)

x	5	6	9	11
y=f(x)	12	13	14	16

Module -5

- 19 a) Using Gauss- Seidel iteration method solve $27x + 6y - z = 85, x + y + 54z = 110, 6x + 15y + 2z = 72$ (7)

- b) Compute $y(0.1)$ by fourth order Runge-Kutta method, given $\frac{dy}{dx} = e^x + y, y(0) = 0$. (Take $h = 0.1$). (7)

- 20 a) Certain experimental values of x and y are given below (7)

x	0	2	5	7
y	-1	5	12	20

Fit a straight line of the form $y = a + bx$ to the above data.

- b) Given $\frac{dy}{dx} = xy + y^2, y(0) = 1, y(0.1) = 1.1168, y(0.2) = 1.2774, y(0.3) = 1.5041$. Find $y(0.4)$ using Adams- Moulton method. (7)
