

JK Lakshmi Pat University, Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Backlog), April 2018
B. Tech (Common for all), Semester IV

Roll No.....

MA 402: Numerical and Statistical Methods

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write or mark anywhere other than your roll number on question paper.
2. Use of calculator and statistical tables is permitted.

Q.1 Choose the correct answer for the following problems (10 questions @ 1 mark) 10

- i. The convergence of which of the following method is sensitive to starting value?
(a) False position (b) Gauss Seidel method
(c) Newton-Raphson method (d) All of these
- ii. We wish to solve $x^2 - 2 = 0$ by Newton Raphson technique. If initial guess is $x_0 = 1.0$, subsequent estimate of x (i.e. x_1) will be;
(a) 1.414 (b) 1.5 (c) 2.0 (d) None of these
- iii. The Gauss elimination method for solving a system of linear algebraic equations leads to;
(a) Diagonal matrix (b) Lower triangular matrix
(c) Upper triangular matrix (d) Singular matrix
- iv. If $\Delta f(x) = f(x + h) - f(x)$, then for a constant x , Δk is;
(a) 1 (b) 0 (c) $f(k) - f(0)$ (d) $f(x + k) - f(x)$
- v. Find the match of ABCD in the following;
A. Newton-Raphson 1. Integration
B. Runge-Kutta 2. Root finding
C. Gauss-Seidel 3. Ordinary Differential Equations
D. Simpson's Rule 4. Solution of system of Linear Equations
(a) 2341 (b) 3214 (c) 1423 (d) 1234
- vi. Which of these measures can be used to present an average for data?
(a) Standard deviation, range and mean (b) Mean, median and mode
(c) Mean, beta and normal distribution (d) Median, range, normal distribution
- vii. Accepting a false null hypothesis is an example of;
(a) Type II error (b) Probability testing
(c) Significance testing (d) Type 1 error
- viii. A sample of 22 observations is collected in order to perform a chi-square test of a single variance. If the hypothesized variance of the population equals the variance of the sample, what is the value of the chi-square test statistic?
(a) 21 (b) 22 (c) 23 (d) 43
- ix. The test statistics for the ratio of two sample variances is;
(a) z (b) F (c) t (d) χ^2

- x. Correlation coefficient between two variables is -0.947. What can be concluded?
 (a) Strong positive relationship (b) Strong negative relationship
 (c) Weak positive relationship (d) Weak negative relationship

Q.2 Solve the following problems (4 questions @ 2.5 marks)

- Prove that $E = \Delta + 1$.
- Explain the difference between regula falsi method and secant method.
- In testing a certain kind of truck tyre over a rugged terrain, it is found that 25% of the trucks fail to complete the test run without a blowout and of the next 15 trucks tested, find the probability that fewer than 4 have blowouts.
- For testing a hypothesis concerning difference of means, what are the test statistic one should use? Explain with the criteria of selection of a statistic.

Q.3A Find the real root of the equation $x^3 - 4x - 9 = 0$ in the interval $[2, 3]$ using regula falsi method. Perform till 2 iterations. 05

Q.3B Using Newton's formula, find the first order derivative of y at $x = 2$ for the following data. 05

x	2	4	6	8	10
y	0	0	1	0	0

Q.4A Apply Simpson's 1/3 rule to find the approximate mileage travelled by a train between 11.50 AM to 12.30 PM from the following data 05

Time (t)	11:50 AM	12:00 PM	12:10 PM	12:20 PM	12:30 PM
Speed (Kms/hr)	30	24	19	16	13

Q.4B Given $\frac{dy}{dx} = 4y$ with $y(0) = 1$, $y(0.1) = 1.492$, $y(0.2) = 2.226$ and $y(0.3) = 3.320$. Find $y(0.4)$ using Milne predictor-corrector method. 05

Q.5A Find the interpolation polynomial $f(x)$ from the table using Lagrange's formula. 05

x	-1	0	2	3
y	-8	3	1	2

Q.5B In an intelligence test administered to 1000 students, the average score was 42 and the standard deviation was 24. Find the number of students exceeding a score of 50. 05

Q.6A On an elementary school examination in spellings, the mean grade of 32 boys was 72 with a standard deviation of 8, while the mean grade of 36 girls was 75 with a standard deviation of 6. Test the hypothesis at 0.01 level of significance that the girls are better in spelling than the boys. 05

Q.6B Two independent samples of sizes 9 and 8 gave the sum of squares of deviations from their respective means as 160 and 91 respectively. Can the samples be regarded as drawn from the two normal populations with same variance? Given, $F_{0.05}(8,7) = 3.73$, $F_{0.05}(7,8) = 3.50$. 05

Q.7A The probability of A, B and C to become MD's of a factory are 5/10, 3/10 and 2/10 respectively. The probabilities that the bonus scheme will be introduced if they become MD's are 0.02, 0.03 and 0.04. Find the probability of A to become MD's if bonus scheme is introduced. 05

- Q.7B Given $\Sigma x = 146$, $\Sigma y = 48$, $\Sigma x^2 = 3550$, $\Sigma y^2 = 352$, and $\Sigma xy = 1101$. Find the equation of least squares line that approximates the regression of x on y and y on x . Also find the correlation coefficient. 05

- Q.8 Write down the significance of interpolation in engineering context. Compute $f(16)$ using Sterling's central difference interpolation from the following table. 10

x	0	4	8	12
$f(x)$	143	158	177	199

OR

- Q.8 To test the effectiveness of inoculation against cholera, the following results were obtained. 10

	Attacked	Not attacked
Inoculated	30	160
Not inoculated	140	460

Does inoculation prevents attack from cholera? (Use 5% level of significance)

- Q.9A Solve the following system of equations using Gauss Seidel iteration method. Perform up to 4 iterations. 10
 $8x + y - z = 8$; $2x + y + 9z = 12$; $x - 7y + 2z = -4$.

- Q.9B Explain the following by taking a suitable example. 10
 (a) Level of significance
 (b) Interval estimation
 (c) Sampling
 (d) Interpolation

OR

- Q.9B In 120 throws of a single dice, the following results were obtained. 10

Faces	1	2	3	4	5	6
f_0	30	25	18	10	22	15

Test the goodness of fit to find whether the results are based the equal probability of each face. Use 5% level of significance.