



# NALLA MALLA REDDY ENGINEERING COLLEGE

## AUTONOMOUS INSTITUTION

B.Tech II-Year I-Semester Examinations, JULY-2023 (Supplementary)

Subject Code: MA311BS

Date of Exam:

### MATHEMATICAL AND STATISTICAL FOUNDATIONS

(Common to all)

Time: 3 Hours

Max.Marks:75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

#### Bloom's Taxonomy Levels (BTL)

Remember	L1	Analyze	L4
Understand	L2	Evaluate	L5
Apply	L3	Create	L6

#### PART - A

Max.Marks:25

S.No		Coverage		BTL	Marks
1.	a)	From Unit-I	Find an inverse of 2 modulo 17	L2	[2 M]
	b)	From Unit-I	Find the remainder $25^{25}$ is divided by 26	L2	[3 M]
	c)	From Unit-II	Define discrete and continuous random variable.	L1	[2 M]
	d)	From Unit-II	If the mean of Binomial distribution is 3 and variance $9/4$ , obtain the value of n.	L2	[3 M]
	e)	From Unit-III	A sample size 80 taken from a population whose S.D is 15. Find the standard error of means.	L3	[2 M]
	f)	From Unit-III	Write the applications of normal distribution.	L2	[3 M]
	g)	From Unit-IV	Discuss the Level of significance	L2	[2 M]
	h)	From Unit-IV	Define Type-I, Type-II errors	L1	[3 M]
	i)	From Unit-V	What is Stochastic matrix?	L1	[2 M]
	j)	From Unit-V	If the transition probability matrix is $\begin{bmatrix} 0.1 & 0.2 & x \\ 0.3 & y & 0.4 \\ z & 0.4 & 0.3 \end{bmatrix}$ . Find x, y and z	L2	[3 M]

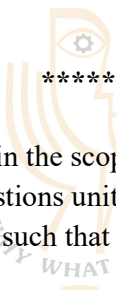
#### PART - B

Max.Marks:50

S.No		Coverage		BTL	Marks
2.	a)	From Unit-I	Find all solutions of Linear congruence $3x \equiv 2 \pmod{7}$	L3	[5 M]
	b)	From Unit-I	Using Fermat's factorization method, factor the following positive integers: i) 11021 ii) 7709	L4	[5 M]
			OR		
3.	a)	From Unit-I	Find GCD using Euclidian algorithm i) (112823, 6409) ii) (615, 1080).	L3	[5 M]
	b)	From Unit-I	Solve the system of congruence $x \equiv 3 \pmod{7}$ , $x \equiv 7 \pmod{12}$ , $x \equiv 1 \pmod{17}$ .	L4	[5 M]

4.	a)	From Unit-II	Fit a parabola to the form $y = a_0 + a_1x + a_2x^2$ for the following data	L3	[5 M]																
	X	10	15			20	25	30	35												
	Y	35.3	32.4			29.2	26.1	23.2	20.5												
	b)	From Unit-II	Given that $f(x) = \begin{cases} 0 & \text{if } x \leq 1, \\ k(x)^4 & \text{if } 1 < x \leq 2, \\ 0 & \text{if } x > 2 \end{cases}$ is a probability density function, then find i) k ii) mean iii) Variance.	L4	[5 M]																
			OR																		
5.	a)	From Unit-II	Average number of accidents on any day on a national highway is 1.8. Determine the probabilities that the number of accidents are i) at least one ii) at most one	L4	[5 M]																
	b)	From Unit-II	Find the Karl Pearson correlation coefficient of following data	L3	[5 M]																
			<table><tr><td>x</td><td>100</td><td>102</td><td>100</td><td>99</td><td>97</td><td>98</td><td>96</td></tr><tr><td>y</td><td>98</td><td>99</td><td>95</td><td>92</td><td>85</td><td>70</td><td>65</td></tr></table>	x	100	102	100	99	97	98	96	y	98	99	95	92	85	70	65		
x	100	102	100	99	97	98	96														
y	98	99	95	92	85	70	65														
6.	a)	From Unit-III	In a normal distribution 31% of the items are under 45 and 18% are over 64. Find the mean and variance of the distribution.	L3	[5 M]																
	b)	From Unit-III	Sample of size 2 are taken from the population 4,8,12,16,20,24 without replacement. Find (a) Mean of the population (b) Standard deviation of the population (c) The mean of the sampling distribution of the means (d) the standard deviation of the sampling distributions of means	L3	[5 M]																
			OR																		
7.	a)	From Unit-III	In a school 1000 students had written an exam. The mean of the test is 35 and S.D is 5. Assuming the distribution to be normal find (i) How many students marks lie between 25 and 40 (ii) How many get more than 40 (iii) How many get below 20.	L4	[5 M]																
	b)	From Unit-III	i) Explain Sampling distribution with example. ii) State Central Limit Theorem	L2	[5 M]																
8.	a)	From Unit-IV	A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. Test whether the sample has come from a population with mean 38 . Also calculate 95% confidence interval for population.	L3	[5 M]																
	b)	From Unit-IV	Construct 99% confidence interval for the true proportion of computer literates if 50 out of 200 persons from rural areas are computer literates.	L4	[5 M]																
			OR																		
9.	a)	From Unit-IV	A sample of 100 electric bulbs produced by manufacturer A showed a mean life time of 1190 hours	L4	[6 M]																

			and a standard deviation of 90 hours. A sample of 75 bulbs produced by manufacturer by B showed a mean life time of 1230 hours, with a standard deviation of 120 hours. Is there a difference between the mean life time of two brands at a significance level of 0.05		
	b)	From Unit-IV	Explain the testing of hypothesis.	L2	[4 M]
10.	a)	From Unit-V	Three boys A, B, C are throwing a ball to each other. B always throws the ball to C, C always throws the ball to A; but A is just as likely to throw the ball to C as to B. Show that the process is Markovian. Find the transition matrix and classify the states. Do all the states are ergodic.	L4	[7 M]
	b)	From Unit-V	Define Markovian process with example	L2	[3 M]
			<b>OR</b>		
11.	a)	From Unit-V	If the transition probability matrix of market shares of three brands A, B and C is $\begin{bmatrix} 0.2 & 0.4 & 0.4 \\ 0.7 & 0.2 & 0.1 \\ 0.3 & 0.3 & 0.4 \end{bmatrix}$ and the initial market shares are 30%, 30% and 40%. Find a) The market shares in second and third periods. b) The limiting probabilities.	L4	[10 M]



**NOTE:**

1. Ensure that all the questions lie within the scope of the syllabus.
2. Please ensure the distribution of questions unit wise as mentioned.
3. Part – A questions should be framed such that they can be written by students in about 2 or 3 minutes for each.
4. **Part – B questions should be framed such that they can be written by students in about 25 to 30 minutes for each.**
5. Each question in part-B shall have a maximum of three sub questions with a minimum of 3 marks for any sub question [(3+3+6)/ (5+5)/ (6+4)/ (7+3)/ (10)].
6. Please verify data inadequacy by solving the numerical questions.
7. Please use **Font name:** Times New Roman and **font size:** 12 to save the question paper.
8. Please follow bloom's taxonomy while preparing the questions and mention the **BTL** for each of questions.