MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : BS-M301 Mathematics III

UPID : 003523

Time Allotted : 3 Hours (E.E.) *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [1 x 10 = 10]

(i) When variance of a random variable is 2/3 , then var (3x+7) is
a) 8
b) 2
c) 6
d) 11

(ii) The mode of the following data 2,1,3,2,1,5,2,2,1,6,4,2,1,3 is
(a) 5
(b) 2
(c) 3
(d) 1

(iii) If two events A and B are independent and P(A)=0.2, P(B)=0.3 , then the value of P(AUB)=

(iv) A random variable X has a Poisson distribution such that P(1)=P(2). Then the Standard Deviation of X is .....

(v) Which probability distribution has the same expected value and variance?
a) Binomial b) Poisson c) Hypergeometric d) Negative Binomial

(vi) If X has Binomial distribution with parameter n and p, then its variance is .....

(vii) Kurtosis reveals the shape of the distribution at the top:

- True
- False

(viii) In a test of hypothesis type I Error is committed when
a) Null hypothesis is rejected through it was really false.
b) Null hypothesis is rejected through it was really true.
c) Null hypothesis is accepted through it was really false.
d) Null hypothesis is accepted through it was really true.

(ix) If the correlation coefficients of x,y is 0.8 and that of u, v is 0.6 then
a) association of x and y is lower then that of u and v.
b) association of x and y is higher then that of u and v.
c) association of x and y is same as that of u and v.
d) None of these.

(x) If probability of hitting a target by A, B and C are respectively 0.3, 0.4, 0.5, then the probability that the target will be hit by A but not by B and C is .....

(xi) Two numbers are chosen from the set {1,2,3,4,5,6} one after another without replacement. The probability that the smaller value of the two is less than 4 is ....

(xii) What is the area under a conditional Cumulative density function?

Group-B (Short Answer Type Question)

Answer any three of the following [5 x 3 = 15]

2. A box contains 2 red & 3 green balls. Two balls are drawn from the box without replacement. [5]
a) If the 1st ball is green then what is the probability that the 2nd ball is also green?
b) What is the probability that the 2nd ball is Red where the first ball can have any colour?

3. A fair coin is tossed 10 times. Find the probability of getting at least 7 heads. [5]

4. A die is thrown 6 times. If the experiment is repeated 729 times, then in how many cases at least 3 times a 5 or 6 will appear? [5]

5. Using Z-transform solve the difference equation

$$x_{n+2} + 4x_{n+1} + 3x_n = 3^n \text{ with } x_0 = 0,\ x_1 = 1$$

6. Following is a grouped frequency distribution having a missing frequency. The mean of the distribution is 127.5. Find the missing frequency [5]

Class interval	100-109	110-119	120-129	130-139	140-149	150-159
Frequency	5	7	-	8	4	6

Group-C (Long Answer Type Question)

Answer any three of the following [15 x 3 = 45]

7. (a) Show that the mean of the Binomial distribution with p probability of success and n trials is np. [8]

(b) Show that the mean of the Poisson distribution is μ, if the probability mass function is $e^{-\mu}\mu^x/x!$ [7]

8. 1. From the following cumulative frequency distribution of marks obtained by 22 students, calculate [10+5]

a. A.M

b. median

c. mode

Marks	No of students
Below 10	3
Below 20	8
Below 30	17
Below 40	20
Below 50	22

2. Calculate mean

Class Interval	10-25	25-40	40-55	55-70	70-85	85-100
Number of Students	2	3	7	6	6	6

9. (a) The number of telephone calls arriving on an internal switch board of an office is 90 per hour. Find the probability that at the most 1 to 3 calls in a minute on the board arrive. (Use $e^{-1.5} = 0.223$) [5]

(b) Six dice are thrown together at a time, the process is repeated 729 times. How many times do you expect at least three dice to have 4 to 6? [5]

(c) Probability distribution of blood types in India is given in the table [5]

Types	O	A	B	AB
Probability	0.3712	0.2288	0.3226	0.0774

A random sample of 10 is considered from Indian population. What is the probability that there will be 4 Os, 3 As, 2 Bs and 1 AB blood types, respectively?

10. (a) Find the Z transform of [5]

$$\frac{2z^2 + 1z}{(z+2)(z-4)}$$

(b) Find the inverse Z-transform of the function [5]

$$\frac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$$

(c) Find the inverse Z-transform of the function [5]

$$z(z-6)^{-2} \text{ when } |z| > 6$$

1. Calculate Skewness and Kurtosis for the following distribution and comment the nature of the distribution [8+7]

Mid value:	34.5	44.5	54.5	64.5	74.5	84.5	94.5	total
Frequency:	2	3	11	20	32	25	7	100

2.

Find the co efficient of skewness

Marks:	55-58	58-61	61-64	64-67	67-70
Frequency:	12	17	23	18	11