S.No. 409 BATCH: 87-2016 Reg.No. [ ]



**END OF SEMESTER EXAMINATIONS, NOVEMBER – 2017**
**MATHEMATICAL STATISTICS**
**SUBJECT CODE: 08UAMA06**

**MAJOR: B.Sc., (Mathematics)** **SEMESTER : III**
**TIME : 3 HOURS** **MAX.MARKS: 75**

## SECTION-A (5 x 2 = 10)

**Answer ALL questions:**

1. Write any two merits of Arithmetic Mean.

(OR)

2. Write down the properties of probability density function.
3. Define independent events, mutually exclusive events.

(OR)

4. State the addition law of probability.
5. Prove that $P(\overline{A}) = 1 - P(A)$.

(OR)

6. Write down the formula for Karl Pearson's co-efficient of Skewness and Bowley's coefficient of Skewness.
7. Let X and Y be two random variables such that $Y \le X$ then prove that $E(Y) \le E(X)$

(OR)

8. Define moment generating function.
9. Write down the recurrence relation for the moments of the Poisson distribution.

(OR)

10. Define Gamma distribution.

## SECTION-B (5 x 4 = 20)

**Answer ALL questions:**

11. Calculate the mean for the following frequency distribution.

| Class-interval: | 0-8 | 8-16 | 16-24 | 24-32 | 32-40 | 40-48 |
|---|---|---|---|---|---|---|
| Frequency: | 8 | 7 | 16 | 24 | 15 | 7 |

(OR)

12. Calculate the median, quartiles, $4^{th}$ decile and $27^{th}$ percentile for

| x: | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| y: | 1 | 9 | 26 | 59 | 72 | 52 | 29 | 7 | 1 |

13. Prove that if A and B are independent events, then A & $\overline{B}$ are also independent events.

(OR)

14. A problem in statistics is given to the three students A,B and C whose chances of solving it are $\frac{1}{2}, \frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved if all of them try independently?
15. The joint probability distribution of a pair of random variables is given by the following table:

| Y \ X | 1 | 2 | 3 |
|---|---|---|---|
| 1 | 0.1 | 0.1 | 0.2 |
| 2 | 0.2 | 0.3 | 0.1 |

Find (i) The marginal distributions. (ii) The conditional distribution of X given Y =1

(OR)

16. The joint probability density function of a two dimensional random variable (X , Y) is given by
$f(x,y) = 2; \quad 0 < x < 1, 0 < y < x$
$= 0$ else where
    (i) Find the marginal density functions of X and Y.
    (ii) Find the conditional density function of Y given X = x and conditional density function of X given Y = y.
    (iii) Check for the independence of X and Y.
17. Let X be a random variable with the following probability distribution

| x: | -3 | 6 | 9 |
|---|---|---|---|
| $P(X = x)$: | $\frac{1}{6}$ | $\frac{1}{2}$ | $\frac{1}{3}$ |

Find $E(x)$, $E(x^2)$ and $E(2x+1)^2$

(OR)

18. Show that the m.g.f. of a random variable having the p.d.f

$$f(x)=\frac{1}{3} \quad -1<x<2$$
$$=0 \; else\ where$$

is $M(t)=\dfrac{e^{2t}-e^{-t}}{3t}, t \neq 0$

$=1, t=0$

19. Ten coins are thrown simultaneously. Find the probability of getting atleast seven heads.

(OR)

20. Show that for the rectangular distribution $f(x)=\dfrac{1}{2a} \quad -a<x<a$ the m.g.f about origin is $\dfrac{1}{at}(\sinh at)$. Also show that the moments of even order given by $\mu_{2n}=\left(\dfrac{a^{2n}}{(2n+1)}\right)$.

**SECTION-C (5 x 9 = 45)**

**Answer ALL questions:**

21. Calculate (i) Quartile deviation and Mean deviation from Mean, for the following data:

| Marks: | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 |
|---|---|---|---|---|---|---|---|
| No. of Students: | 6 | 5 | 8 | 15 | 7 | 6 | 3 |

(OR)

22. Calculate the mean and standard deviation for the following table giving the age distribution of 542 members.

| Age: | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 |
|---|---|---|---|---|---|---|---|
| No. of Members: | 3 | 61 | 132 | 153 | 140 | 51 | 2 |

23. An urn contains 4 tickets numbered 1,2,3,4 and another contains 6 tickets numbered 2,4,6,7,8,9. If one of the two urns is chosen at random and a ticket is drawn at random from the chosen urn, Find the probabilities that the ticket drawn bears the number (i) 2 or 4 (ii) 3 (iii) 1 or 9

(OR)

24. Two fair dice are thrown independently. Three events A,B and C are defined as follows:
A: odd face with first dice
B: odd face with second dice
C: sum of points on two dice is odd.
Are the events A,B and C are mutually independent?

25. A random variable X has the following probability function.

| x: | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| P(x): | 0 | k | 2k | 2k | 3k | $k^2$ | $2k^2$ | $7k^2$+k |

(i) Find K
(ii) Evaluate $P(x<6)$, $P(x\geq 6)$ and $P(0<x<5)$
(iii) If $P(x\leq k)>\frac{1}{2}$, find the minimum value of k and
(iv) Determine the distribution function of X.

(OR)

26. Let X and Y be jointly distributed with p.d.f

$$f(x,y)=\begin{cases}\frac{1}{4}(1+xy) & |x|<1,\ |y|<1 \\ 0, otherwise\end{cases}$$

Show that X and Y are not independent but $X^2$ and $Y^2$ are independent.

27. In a lottery m tickets are drawn at a time out of n tickets numbered 1 to n. Find the expectation and the variance of the sum S of the numbers on the tickets drawn.

(OR)

28. Find the density function $f(x)$ corresponding to the characteristics function defined as follows:

$$\phi(t)=\begin{cases}1-|t|, & |t|\leq 1 \\ 0, & |t|>1\end{cases}$$

29. Obtain the first four moments about the origin for the binomial distribution.

(OR)

30. X is normally distributed with mean 12 & Standard Deviation 4. Find
$P(x\geq 20)$, $P(x\leq 20)$, $P(0\leq x\leq 12)$
Find $x'$ *when* $P(x>x')=0.24$
Find $x_0'$ & $x_1'$ when $P(x_0'<x<x_1')=0.50$ & $P(x>x_1')=0.25$

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