...stration No.:______________

Course Code:MTH302

Course Title:PROBABILITY AND STATISTICS

2241MTH30... Paper Code: C

Time Allowed: 03:00hrs. Max Marks: 70

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3. Part A contains 30 questions of 1 mark each. 0.25 marks will be deducted for each wrong answer.</ b>
4. Part B contains 5 questions of 10 marks each. Attempt any 4 questions out of these 5 questions. In case all the 5 questions are attempted then only the first four attempted questions will be evaluated.
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Q1)

Part-A

1) $Cov(X+5, Y+4) = ?$

(a) $20\,Cov(X,Y)$

(b) $9\,Cov(X,Y)$

(c) $Cov(X,Y)$

(d) None of these.

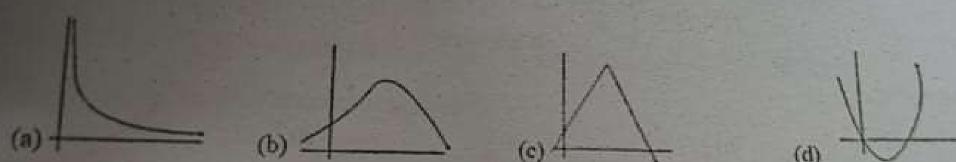
2) The Expectation of the sum of two random variables X and Y is equal to: CO2,L1

(a) E(X) E(Y) (b) E(X) + E(Y) (c) E(X ± Y) (d) E(XY)

3) The parameter of Poisson distribution is 5. What is the parameter of exponential distribution? CO1,L1

(a) $\frac{1}{25}$ (b) 25 (c) 5 (d) $\frac{1}{5}$

4) Which of the following graph represents gamma distribution? CO3,L3



CO3,L3

5) The moment generating function $M_Z(t)$ of a standard normal variate is

(a) e^{t} (b) e^{t^2} (c) $e^{\left(\frac{t^2}{2}\right)}$ (d) None of these

CO3,L3

6) If $x_1, x_2, x_3, \ldots\ldots, x_n$ is a sample drawn from a population then which of the following Is unbiased estimator of population mean?

(a) $\frac{1}{n}\sum(x_i)$ (b) $\frac{1}{n+1}\sum(x_i)^2$ (c) $\frac{1}{n-1}\sum(x_i)$ (d) $\frac{1}{n}\sum(x_i)^2$

CO4,L2

7) If X and Y are independent then

(a) $r_{XY} = 0$ (b) $r_{XY} > 0$ (c) $r_{XY} < 0$ (d) None of the above

CO1,L1

Registration No.: ____________________

8) Any random variable which follows Binomial distribution is known as

(a) Normal variate (b) Binomial variate (c) Poisson variate (d) Geometric variate

9) If the sample average $\bar{x}$ is an estimate of the population mean μ, then $\bar{x}$ is

(a) unbiased and efficient (b) unbiased and inefficient

(c) biased and efficient (d) biased and inefficient

CO1,L1

10) The mean of Binomial distribution is 3 and variance is $\frac{9}{4}$ then the value of n is?

(a) 11 (b) 12 (c) 13 (d) 14

CO4,L2

11) Let X and Y be two random variables with density function $f(x,y) = \begin{cases} 4xy, 0 < x < 1, 0 < y < 1 \\ 0, \quad elsewhere \end{cases}$. The conditional densitty of Y given $X = x$ is

CO3,L3

(a) $f(y/x) = \begin{cases} 2x, 0 < x < 1, 0 < y < 1 \\ 0, \quad elsewhere \end{cases}$

(b) $f(y/x) = \begin{cases} 4y, 0 < x < 1, 0 < y < 1 \\ 0, \quad elsewhere \end{cases}$

(c) $f(y/x) = \begin{cases} 4x, 0 < x < 1, 0 < y < 1 \\ 0, \quad elsewhere \end{cases}$

(d) $f(y/x) = \begin{cases} 2y, 0 < x < 1, 0 < y < 1 \\ 0, \quad elsewhere \end{cases}$

12) A random variable X has a mean 8 and variance 16, and an unknown probability distribution. Find $P(|X - 8| \geq 12)$.

CO1,L1

(a) $\geq \frac{1}{9}$ (b) $\leq \frac{1}{9}$ (c) $\leq \frac{8}{9}$ (d) $\geq \frac{8}{9}$

13) Student's t statistic is defined as follows:

CO1,L1

(a) $t = \frac{\bar{x}-\mu}{S}$ (b) $t = \frac{\bar{x}-\mu}{\left(\frac{S}{\sqrt{n}}\right)}$ (c) $t = \frac{\bar{x}-\mu}{\left(\frac{S}{\sqrt{2n}}\right)}$ (d) $t = \frac{\bar{x}+\mu}{\left(\frac{S}{\sqrt{2n}}\right)}$

CO5,L2

14)

If X and Y are two random variables having the joint probability mass function

$$f(x,y) = \begin{cases} \frac{x + 2y}{27}, x = 0,1,2, y = 0,1,2 \\ 0, elsewhere \end{cases}$$

$P(X + Y \leq 4)$ is?

a) 1 b) $\frac{2}{9}$ c) $\frac{4}{9}$ d) $\frac{1}{3}$

CO1,L1

15) If s^2 is the sample variance of a random sample $x_1, x_2, x_3, \ldots\ldots\ldots, x_n$ with sample mean $\bar{x}$

and $S^2 = \frac{1}{n-1}\sum(x_i - \bar{x})^2$ then which of the following is correct?

(a) $\frac{S^2}{n} = \frac{s^2}{n+1}$ (b) $\frac{S^2}{n-1} = \frac{s^2}{n}$ (c) $\frac{S^2}{n} = \frac{s^2}{n-1}$ (d) $\frac{S}{n} = \frac{s}{n-1}$

CO5,L2

16) The gamma function is defined as

(a) $\Gamma(a) = \int_0^\infty x^{a-1}e^{-x}dx,\ for\ a > 0$

(b) $\Gamma(a) = \int_0^\infty x^{a}e^{-x}dx,\ for\ a > 0$

(c) $\Gamma(a) = \int_0^\infty x^{a-1}e^{x-1}dx,\ for\ a > 0$

(d) none of these

CO1,L1

...istration No.: ____________

...gamma function is defined by

(a) $\Gamma(\alpha)=\int_0^\infty x^{\alpha-1}e^{-x}dx$ (b) $\Gamma(\alpha)=\int_0^\infty x^{\alpha+1}e^{-x}dx$ (c) $\Gamma(\alpha)=\int_0^\infty x^{\alpha}e^{x}dx$ (d) $\Gamma(\alpha)=\int_0^\infty xe^{-x}dx$

18) If X is a negative binomial variate with $n=10, p=\frac{1}{2}$. Find $P(X=4)$. CO1,L3

a) 0.658 b) 0.256 c) 0.479 d) 0.153

19) The unbiased estimator of the population variance σ^2 is CO3,L3

(a) $S^2=\frac{\Sigma(x-\mu)^2}{n}$ (b) $S^2=\sqrt{\frac{\Sigma(x-\mu)^2}{n}}$ (c) $S^2=\frac{\Sigma(x-\mu)^2}{n-1}$ (d) $S^2=\sqrt{\frac{\Sigma(x-\mu)^2}{n-1}}$

20) The joint distribution of X and Y is given by $f(x,y)=k(1-x-y), 0<x<y<\frac{1}{2}$. The marginal distribution of X is CO4,L2

(a) $3-4x$ (b) $4-3x$ (c) $3-4x^2$ (d) $4-3x^2$

21) For a two tailed test for single mean, the null hypothesis is: CO1,L1

(a) $\mu=\mu_0$ (b) $\mu\neq\mu_0$. (c) $\mu<\mu_0$ and $\mu>\mu_0$ (d) None of these.

22) **Which of the following is the correct test statistic for Chi Square-test for goodness of fit?** CO5,L2

(f_i and e_i are observed and expected frequencies respectively.)

(a) $\Sigma\frac{(f_i-e_i)^2}{e_i}$ (b) $\Sigma\frac{(f_i-e_i)^2}{f_i}$ (c) $\Sigma\left(\frac{f_i-e_i}{f_i}\right)^2$ (d) $\Sigma\left(\frac{f_i-e_i}{e_i}\right)^2$

CO5,L1

23) *The value of estimator is called*

(a) estimation (b) variable (c) estimate (d) constant

CO4,L2

24) ***If $x_1, x_2, x_3, \ldots\ldots, x_n$ Is a sample drawn from a population then which of the following is unbiased estimator of population variance?***

(a) $\frac{1}{n-1}\sum(x_i-\bar{x})^2$ (b) $\frac{1}{n+1}\sum(x_i-\bar{x})^2$ (c) $\frac{1}{n-1}\sum(x_i-\bar{x})$ (d) $\frac{1}{n}\sum(x_i-\bar{x})^2$

CO4,L1

25) The correlation for the values of two variables moving in the same direction is known as

a) Positive correlation b) Perfectly positive correlation

c) highly positive correlation d) Uncorrelated

CO2,L1

26) If the correlation coefficient between X and Y is 0.4 then the correlation coefficient between $2X$ and $2Y$ is?

(a) 0.2 (b) 0.16

(c) 0.4 (d) 0.8

CO2,L1

Registration No.:________________________

27) Which of the following is probability distribution function of Negative binomial Distribution?

(a) $\binom{x}{k}p^k q^{x-k}$ (b) $\binom{x-1}{k}p^k q^{x-k}$ (c) $\binom{x}{k-1}p^k q^{x-k}$ (d) $\binom{x-1}{k-1}p^k q^{x-k}$

28) If the coefficient of correlation is 0 then the two lines of regression will be? CO3,L3

(a) perpendicular (b) coincide (c) parallel (d) at 45 degree angle

29) The degree of freedom for paired t-test based on n pairs of observations is CO2,L1

(a) $2n-1$ (b) $2(n-1)$ (c) $n-1$ (d) $n-2$

30) If 'X' follows Binomial Distribution with number of trials equal to '20' and probability of failure in a single trail (3/4), then the m.g.f. for 'X' is: CO5,L2

(a) $\left(\frac{3}{4}+\frac{e^t}{4}\right)^{20}$ (b) $\left(\frac{1}{4}+\frac{e^t}{4}\right)^{20}$ (c) $\left(\frac{3}{4}+\frac{3e^t}{4}\right)^{20}$ (d) $\left(\frac{1}{4}+\frac{3e^t}{4}\right)^{20}$

Part-B

Q2). An unbiased coin is tossed eight times. Using binomial distribution, find the probability of getting: CO3,L3

(a) less than 4 heads (b) more than five heads.

CO3,L3, [10 marks]

Q3). Find Karl Pearson's coefficient of correlation between capital employed and profit obtained from the following data.

Capital Employed (Rs. In Crore)	10	20	30	40	50	60	70	80	90	100
Profit (Rs. In Crore)	2	4	8	5	10	15	14	20	22	50

CO2,L1, [10 marks]

Q4). The average number of acres burned by forest and range fires in a large Mexico country is 4300 acres per year, with a standard deviation of 750 acres. The distribution of the number of acres burned is normal. Find the probability that lies between 2500 and 4200 acres will be burned in any given years.

Given:

$P(Z < -0.79) = 0.2148$, $P(Z < -0.13) = 0.4483$, $P(Z < 1.85) = 0.9678$, $P(Z < -2.40) = 0.0082$

CO3,L3, [10 marks]

Q5). Find the maximum likelihood estimator for the parameter λ of a Poisson distribution based on a sample size n. Also find its variance.

CO4,L2, [10 marks]

Q6).

The following figures show the distribution of digits in numbers chosen at random from a telephone directory:

Digits	0	1	2	3	4	5	6	7	8	9	Total
Frequency	1026	1107	997	966	1075	933	1107	972	964	853	10000

Test whether the digits may be taken to occur equally frequently in the directory. Test at 5% level of significance. (Given: The tabulated value of chi-square with 9 d.f is 16.919 at the 5% level of significance.)

CO5,L2, [10 m

--End of Question paper--

Registration No.:____________________

23241MTH29337
Paper Code: A

Course Code:MTH302
Course Title:PROBABILITY AND STATISTICS

Time Allowed: 03:00hrs. **Max Marks: 70**

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Part-B

Q2). Derive the formula for moment generating function of Normal Distribution. Along with this evaluate the values of mean and variance.

CO3,L3, [10 marks]

Q3). X and Y are two random variables having variances σ_x^2 and σ_y^2 respectively. Correlation coefficient between X and Y is r. $U = X + kY$ and $V = X + \frac{\sigma_x}{\sigma_y}Y$. Find the value of k such that U and V are uncorrelated.

CO2,L1, [10 marks]

Q4). For a random sample of 10 pigs, fed on diet A, the increases in weight in a certain period were: 10, 6, 16, 17, 13, 12, 8, 14, 15, 9 lbs. For another random sample of 12 pigs fed on diet B, the increases in weights in the same period were: 7, 13, 22, 15, 12, 14, 18, 8, 21, 23, 10, 17 lbs. Find if the two samples are significantly different regarding the effect of diet, given that for d.f. ν=*20, 21, 22,* the five percent values of t are respectively 2.09, 2.07, 2.06.

CO5,L2, [10 marks]

Q5). Find the maximum likelihood estimate of the parameter λ of a population having density function given as

$$f(x) = \begin{cases} \frac{2}{\lambda^2}(\lambda - x), & 0 < x < \lambda \\ 0, & \text{elsewhere} \end{cases}$$

CO4,L2, [10 marks]

for a sample of unit size. Show also that the calculated estimate is biased.

Q6). In a binomial distribution of 10 independent trials, probabilities of 3 and 4 successes are 0.3452 and 0.2107 respectively. Find the value of parameter p of the distribution.

CO3,L3, [10 marks]

--End of Question paper--

Registration No.:____________________

22232MTH29317
Paper Code: A

Course Code:MTH305
Course Title:PROBABILITY AND STATISTICS

Time Allowed: 03:00hrs. **Max Marks: 70**

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Part-B

Q2). A research firm is investigating the safety of a dangerous road intersection. Historical data (from past police records) indicates an average of 6 accidents per month at this particular intersection. The number of accidents are distributed according to a Poisson distribution.

What is the probability of three or fewer accidents?
What is the probability of more than 5 accidents?

CO3,L2, [10 marks]

Q3).

The random variable X has probability density function is: $f(x) = k(x^3 - x)/4$ for an interval $0 < x < 2$. Find the value of k and hence find the mean and standard deviation of the distribution.

CO1,L3, [10 marks]

Q4).

Obtain the regression line of y on x for the given data. Hence find value of y for x=5.5

x	1	2	3	4	5	6	7	8
y	3	7	10	12	14	17	20	24

CO5,L1, [10 marks]

Q5).

Consider two random variables X and Y with joint PMF given as

	$Y=0$	$Y=1$	$Y=2$
$X=0$	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{8}$
$X=1$	$\frac{1}{8}$	$\frac{1}{6}$	$\frac{1}{6}$

a. Find $P(X=0, Y \le 1)$.
b. Find the marginal PMFs of X and Y.
c. Find $P(Y=1|X=0)$.

CO1,L3, [10 marks]

Q6). An event has 6 possible outcomes with the probabilities p1=1/2, p2=1/4, p3=1/8, p4=1/16, p5=1/32, p6=1/32. Find the entropy of the system. Also find the rate of information if there are 16 outcomes per second.

CO5,L1, [10 marks]

--End of Question paper--

Registration No.:____________________

23241MTH28702

Paper Code: A

Course Code:MTH302
Course Title:PROBABILITY AND STATISTICS

Time Allowed: 03:00hrs. **Max Marks: 70**

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Part-B

Q2). A large chain retailer purchases a certain kind of electronic device from a manufacturer. The manufacturer indicates that the defective rate of the device is 3%.

(a) The inspector randomly picks 20 items from a shipment. What is the probability that there will be at least one defective item among these 20?

(b) Suppose that the retailer receives 10 shipments in a month and the inspector randomly tests 20 devices per shipment. What is the probability that there will be exactly 3 shipments each containing at least one defective device among the 20 that are selected and tested from the shipment?

CO1,L3, [10 marks]

Q3).

Q. In random sampling from Normal population $N(\mu, \sigma^2)$, find (i) the MLE for μ when σ^2 is known.

(ii) the MLE for σ^2 when μ is known. (iii) the simultaneous estimation of μ and σ^2.

(MLE stands for maximum likelihood estimate)

CO4,L2, [10 marks]

Q4). In a partially destroyed laboratory, record of an analysis of correlation data, the following results only are legible: Variance of X = 9,

Regressions equation : 8X-10Y+66=0 , 40X-18Y=214 .

What are: (i) the means values of X and Y (ii) the correlation coefficient between X and Y (iii) the variance of Y

CO1,L1, [10 marks]

Q5).

The average number of acres burned by forest and range fires in a large Mexico country is 4300 acres per year, with a standard deviation of 750 acres. The distribution of the number of acres burned is normal. Find the probability that lies between 2500 and 4200 acres will be burned in any given years.

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CO3,L3, [10 marks]

Q6).

a. In one sample of 8 observations, the sum of the squares of deviations of the sample values from the sample mean was 84.4 and in the other sample of 10 observations it was 102.6. Test whether this difference is significant at 5 per cent level, given that the 5 percent point of F for $n_1 = 7$ and $n_2 = 9$ degrees of freedom is 3·29.

b. The theory predicts the proportion of beans in the four groups A, B, C and D should be 9: 3: 3: 1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory? [Given: tabulated $\chi^2_{0.05}$ for 3 degrees of freedom = 7.815].

CO5,L2, [10 marks]

--End of Question paper--