MANIPAL UNIVERSITY

Reg. No.										

Deemed- to -be -University under Section 3 of the UGC Act, 1956

DEPARTMENT OF SCIENCES,
I SEMESTER M.Sc (Applied Mathematics & Computations)
END SEMESTER EXAMINATIONS, Nov/Dec 2017

Subject [MATHEMATICAL STATISTICS- MAT-4107]

(REVISED CREDIT SYSTEM)

Time: 3 Hours Date: 23/11/2017 MAX. MARKS: 50

Note: (i) Answer all **FIVE FULL** questions

1A	Let X_1, X_2 be a random sample of size 2 from a distribution having pdf f(x, θ) = $\frac{1}{\theta}e^{\frac{-x}{\theta}}$, x>0. We reject H_0:θ=2 and accept H_1 : θ=1, if the observed values of (X_1 ,X_2) are such that $\frac{f(X_1,2)f(X_2,2)}{f(X_1,1)f(X_2,1)} \leq \frac{1}{2}$. Find the significance level of the test. Also find the power of the test when H_0 is false.	**4**
1B	Find the mgf of normal distribution. Hence find its mean and variance	**3**
1C	The Mandlean theory states that the probabilities of classification a, b, c,d are respectively 9/16, 3/16, 3/16 and 1/16 from a sample of 160. The actual numbers observed were 86, 35, 26, and 13. Is this consistent with the theory at 0.01 significance level?	**3**
2A.	Urn A contains 8 white and 7 black balls. Urn B contains 9 black and 7 white balls. A ball is randomly drawn from Urn A and placed in B and then a ball is transferred from Urn B to A, finally a ball is selected from Urn A. What is the prob. that this ball is white?	**4**
2B.	With usual notations , prove that $-1 \leq \rho \leq 1$. If Y = aX + b then show that $\rho = \pm 1$	**3**

2C	If X and Y are independent and have standardized normal distribution, Show that Z= $\frac{X}{Y}$ has Cauchy's distribution.	**3**
3A	The joint pdf of 2 dimensional random variable is given by $f(x,y) = x^2 + \frac{xy}{3}, \quad 0 < x < 1, \quad 0 < y < 2$ $= 0 \qquad elsewhere$ Compute i) V(Y) (ii) P(2X+Y > 1) 1.	
3B	Let S^2 be the sample variance and $\bar{x}$ be the sample mean of a random sample of size 25 from N(3, 100). Evaluate P($\bar{x}$ <6, 55.2< S^2 < 145.6)	**3**
3C	An urn contains 2 white and 2 black balls and a second urn contains 2 white and 4 black balls. i) If one ball is drawn from each of the urn what is the probability that they will be of the same colour? ii) If an urn is selected at random and one ball is drawn from it , what is the probability that it will be white?	**3**
4A	A binary communication channel carries data as one of two types of signals denoted by 0 and 1. Due to noise a transmitted 0 is received as 1 with probability 0.06 and 1 is received as 0 with probability 0.09. probability of transmitting 0 is 0.45. If a signal is sent determine i) probability that 1 is received (ii) probability that 0 was transmitted given that 0 was received (iii) probability that 101 is received as 011.	**4**
4B	Let a random sample of size 15 from a normal distribution $N(\mu, \sigma^2)$ yield $\bar{x}$ =3.2, S^2 = 4.24. Determine a 90% confidence interval for μ & σ^2 .	**3**
4C	35% of the items are under 45 and 48% of the item over 72. If the item are normally distributed , find the mean and variance of the distribution.	**3**
5A	Suppose that a man has 5 aunts and 6 uncles and his wife has 6 aunts and 5 uncles. What is the probability that he calls 3 men and 3 women so that there are exactly 3 of the man's relatives and 3 of the wife's.	**4**
5B	The number of arrivals of customers during any day follows Poisson distribution with a mean of 5. What is the probability that the total number of customers on two days selected at random is less than 2?	**3**
5C	Let $X_1, X_2, \ldots X_n$ be a random sample of size n from N(θ_1, θ_2). Find the MLE for θ_1 and θ_2.	**3**

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