BRAINWARE UNIVERSITY

Term End Examination 2018 - 19

Programme – M.Tech.(CSE)

Course Name - Applicable Mathematics

Course Code - MMAT010101

(Semester – 1)

Time allotted: 3 Hours **Full Marks : 70**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Questions) 10 x 1 = 10

1. ***Choose the correct alternative from the following:***

(i) In a Binomial (n,p) distribution, if its mean and variance are 2 and 16/9 respectively, then the values of n and p are:

a. $18, \frac{1}{9}$ b. $16, \frac{1}{9}$

c. $16, \frac{1}{8}$ d. $18, \frac{1}{8}$

(ii) If f(G, x) is the chromatic polynomial of a tree with 5 vertices then f(G,3) =

a. 5 b. 320

c. 48 d. 14

(iii) The regression coefficients are

a. independent of change of origin only b. independent of change of scale only

c. independent of change of origin but not of scale d. independent of both change of origin as also of change of scale.

(iv) The condition for independence of two events A and B is

a. $P(A \cap B) = P(A)P(B)$ b. $P(A+B) = P(A)P(B)$

c. $P(A-B) = P(A)P(B)$ d. $P(A \cap B) = P(A)P(B/A)$

(v) The distribution for which mean and variance are equal is

a. Poisson b. Normal

c. Binomial d. Exponential

(vi) If $\sigma = 3$ be the Null hypothesis then which one of the following is a possible Alternative hypothesis

a. $\sigma = 4$ b. $\sigma = 1$

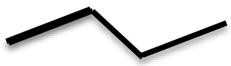
c. $\sigma = 0$ d. $\sigma \neq 3$

(vii) A null graph with n vertices is

a. 1-chromatic b. (n-1)-chromatic

c. n-chromatic d. (n+ 1)-chromatic

(viii) The independence number of the graph

 is

a. 1 b. 2

c. 3 d. none of these

(ix) For the distribution

X	3	5	7	9
f_i	$\frac{1}{2}$	$\frac{1}{5}$	$\frac{1}{7}$	$\frac{11}{70}$

if Y=3X+1 then P(Y=22) is

a. $\frac{1}{2}$ b. $\frac{1}{5}$

c. $\frac{3}{10}$ d. $\frac{1}{7}$

(x) The maximum likelihood estimate is a solution of the equation

a. $\frac{\partial L(\theta)}{\partial \theta} = 0$ b. $\frac{\partial L(\theta)}{\partial \theta} = \text{Constant}$

c. $\frac{\partial L(\theta)}{\partial \theta} = \theta$ d. none of these

Group – B

(Short Answer Type Questions) 3 x 5 = 15

Answer any *three* from the following :		
2.	In a random sample of 525 families owning a television set in a city it is found that 370 have subscribed to a sports channel. Find a 95% confidence interval for the actual proportion of such families in this city which subscribe to sports channel.	5

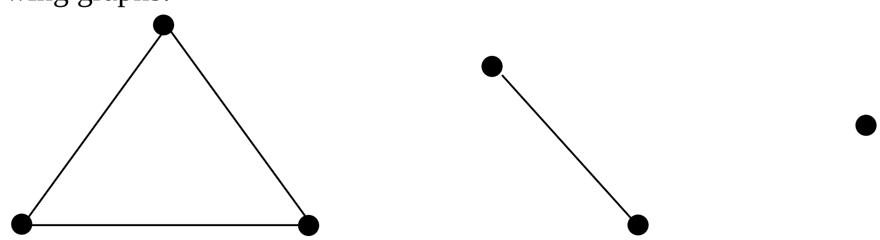
3.	State and prove Chebyshev's inequality.	5
4.	A random variable X with unknown distribution has mean 8 and variance 9. Find $P(-4 < X < 20)$.	5
5.	What is a Bernoulli process. Give one example of a homogeneous Bernoulli process.	5
6.	By re-drawing Kuratowski's First Graph, show that it is non-planar.	5

Group – C

(Long Answer Type Questions) 3 x 15 = 45

Answer any *three* from the following :

7. (a) Find the chromatic polynomial, and hence find the chromatic number for the following graphs:



5

(b) Suppose that a testing procedure A results in 20 unacceptable phones out of 100 produced whereas another testing procedure B results in 12 unacceptable phones out of 100 produced. Can we conclude at 5% level of significance that the two methods are equivalent? 10

8. (a) The joint probability density function of a two dimensional random variable is $f(x,y) = \begin{cases} 6x^2y; 0 < x < 1,\ 0 < y < 1 \\ 0, \quad \text{elsewhere} \end{cases}$.

(i) verify $\int_0^1 \int_0^1 f(x,y)dxdy = 1$.

(ii) Find $P(0 < X < 3/4,\ 1/3 < Y < 2)$.

(iii) Find $P(X + Y < 1)$. 10

(b) For a random variable X, prove that $Var(aX + b) = a^2Var(X)$ where a and b are constants. 5

9. (a) Prove that maximum likelihood estimate of a parameter α of a population having density function $\frac{2}{\alpha^2}(\alpha - x), 0 < x < \alpha$ for a sample of unit size is $2x, x$ being the value. Also show that the estimate is biased. 10

(b) The chromatic number of a circuit with n vertices is

i) 2 if n is even

ii) 3 if n is odd 5

10. (a) The following random samples are measurements of the heat producing capacity in millions of calories per ton of specimens of coal from two mines:

Mine I:	8260	8130	8350	8070	8340	
Mine II:	7950	7890	7900	8140	7920	7840

Test at 5% level of significance whether the difference between the means of these two samples is significant. 8

(b) Prove that for any two events A, B

i) $P(\mathrm{A}+\bar{B}) = 1 - P(\mathrm{B}) + \mathrm{P(AB)}$

ii) $P(\mathrm{A}\,\bar{B}) = \mathrm{P(A)} - \mathrm{P(AB)}$ 3+2

(c) What is the chance that a leap year selected at random will contain 53 Tuesdays? 2

11. (a) Define

(a) null and alternate hypothesis
(b) critical region
(c) type I and type II errors
(d) level of significance
(e) power of a test 10

(b) If the cumulative distribution function of a continuous random variable X is $F(x)$, find the cumulative distribution function of $Y = X + a$ (a is a constant). 3

(c) Define most powerful test. 2
