MATHEMATICAL STATISTICS-I

MULTIPLE CHOICE QUESTIONS

K1- Level Questions

UNIT- 1

1. If g(x) = c, then E(g(x)) =

a) c b)0 c)1 d)E(x)

2.E(x+y)=

a)E(x).E(y)

b)E(x)+E(y)

c)E(xy)+E(x+y)

d)E(x)+E(y)

3 .E(xy)=

a)E(x)+E(y)

b)E(x).E(y)

c)E(xy)+E(x+y)

d)E(x+y)

4. If X is a random variable and a and b are constants then E(ax+b)=

a)aE(x)+0

b)$a^2E(x)+b^2$

c)E(x)

d)aE(x)+b

5.If X is a random variable and a Is a constant then E (aΨ(X))=

a)a E(Ψ(x))

b)a^2 E(Ψ(x))

c)E(Ψ(x))

d)E(a)

6. If X and Y are two random variables Y≤x, then

a)E(y)≥E(x)

b)E(y)≤E(x)

c)E(x)+E(y)=0

d)E(x)-E(y)=0

7) If X and Y are independent random variable and h &k are constants then E(h(x)),E(h(y))=

a)0

b)E(x).E(y)

c)E(h(x)).E(h(y))

d)h^2 E(x).K^2E(y)

8. If X is a random variable then V(ax+b)=

a)a^2 V(x)

b)a v(x)+v(b)

c)0

d)1

9. If b is a constant the then v(b)=

a)1

b) ± 1

c) none of these

d) 0

10. If X and Y is a random variable then cov (x,y)=

a) E(xy)+E(x+y)

b) E(x-E(x)).(y-E(y))

c) E(xy)-E(x+y)

d) E(x+E(x)).(y+E(y))

UNIT- 2

1.Moment generating function

a) M (t)= tx

b) M ( )= ^{tx}

c) (t)=E ( )

d) M ( )=E (^{tx})

2. $'$ =

a) E (X)

b) E ( )

c) E (^{x})

d) E (^{tx})

3. ^{t} moment μ' =

a) E (−

b) E (x-a)

c) (−

d) (x-a)

4.M_{cx}(t)=

a) ^{tcx}

b) E (^{x})

c) ^{x}

d) E ( )

5.M_{cx}(t)=

a) (ct)

b) M_x(t)

c) M_x( )

d) M ( )

6.E(z)=mean=

a) 0

b) 1

c) 2

d) 3

7.A random variable X may have no moments although its M.G.F is

a) Not exist

b) Exist

c) 1

d) 0

8.In M.G.F standard variance is

a) 1

b) -1
c) 0
d) None of these

9.V(Z)=variance=

a) 0
b) 1
c) 2
d) 3

10.ϕ_x(t)=

a) tx
b) E ( )
c) E (x)
d) tx

UNIT- 3

1. The moment generating function of binomial distribution is
a. Mx(t)=E(e^{tx})
b. Mx(t)=E(e^{x})
c. Mx(t)=e^{x}
d. Mx(t)=(e^{tx})
2. ______ does not have additive or reproductive property
a. Binomial distribution
b. Poisson distribution
c. Binomial variate
d. Poisson variate

3.The parameter of binomial distribution is

a. npq
b. pq
c. 0
d. np
4 .The mean of poisson distribution is
a. n
b. nq
c. μ
d. λ

5. The moment generating function of gamma distribution is
a. F(x)=$e^{-x}x^{\lambda-1}$ / (λ)
b. F(x)=e^{-x}

c. $F(x)=x^{\lambda-1}(\lambda)$
d. $x=e^{-1}x^{\lambda-1}(\lambda)$

6. Binomial distribution is

a. $p(x)=x^n p^r q^{n-r}$
b. $p(x)=x^n p^r q^{n+}r$
c. p(x)=pnxrqn-r
d. p(x)=pnxrqn+r

7. All binomial distribution

a. Variance ≤ mean
b. Variance ≥ mean
c. Variance > mean
d. Variance < mean

8. Poisson distribution is proceeding to limit as

a. $\lambda\to0$
b. $\lambda\to-\infty$
c. $\lambda\to\infty$
d. None of these

9. x~ p(λ) to denote that x is a _____ variate with parameter ____

a. Binomial ,np
b. Poison , λ
c. Normal , μ
d. Exponential , λp

10. $M_r t$=

a. $\mathbf{(q+pet)^n}$
b. $(q+pet)^n$
c. $(1+pet)^n$
d. $(q+pet)^{np}$

UNIT- 4

(1) Standard deviation is:

(a) σ^2

(b)σ

(c)π

(d)π^2

(2) Ø(-z)=

(a) 1+Ø (z)

(b) 1-Ø (-z)

(c) -1-Ø (z)

(d) 1-Ø (z)

(3) f(x,a,b)=

(a) 1/(b+a)

(b) 1/(b+b)

(c) 1/(b+d)

(d) 1/(b-a)

(4) The mode of the normal distribution is

(a) μ

(b) π

(c) λ^2

(d) π^2

(5) When z>0, Ø(z)=

(a) Ø(z)

(b) 1-Ø(z)

(c) 1

(d)-1

(6) In which distribution finds large application in statistical quality control in industry for setting control limits?

(a) Binomial
(b) Chi-square
(c) Normal
(d) Poisson

(7) Mean deviation about mean is

(a) 2σ/5

(b) 6σ/8

(c) 4σ/5

(d) 7σ/8

8) The total area under normal probability curve is ……………

(a) 0
(b) -1
(c) 3
(d) 1

9) Linear combination of independent normal variants is also a ……………

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

10) The difference between two Poisson variate is ………………. .

(a) a poisson variate
(b) not a poisson variate
(c) normal variate
(d) not a normal variate

UNIT- 5

1.Moment generating function of gamma distribution is

a.) $\frac{e \quad x}{\Gamma}$
b.) –
c.)log 1 –
d.) $\frac{e \; x}{\Gamma}$

2.The parameter of gamma distribution is

a.)λ
b.)∞
c.)μ
d.) θ

3.The exponential distribution function is

a.) x
b.) x
c.)
d.)

4.The beta distribution of first kind H is

a.)———

b.)———

c.)———

d.)———

5.Cumulant generating function of gamma distribution is

a.)λlog(1-t)
b.)log(1-t)
c.)-λlog(1+t)
d.)-λlog(1-t)

6.MGF of normal variate Mx(t/σ) is

a.) $1 \quad \frac{t}{}$

b.) $1 - \frac{t}{}$

c.) $- \; -$

d.) $1 \quad \frac{t}{}$

7.The variance of exponential distribution is

a.)–
b.)θ
c.)1
d.)—

8.The harmonic mean H is given by

a.)——

b.)——

c.)——

d.)——

9.A Gamma distribution is

a.) $\frac{}{\Gamma}$

. $\frac{e \quad x}{\Gamma}$

c.) $\frac{e \quad x}{\Gamma}$

d.) $\frac{e \quad x}{\Gamma}$

10.The cumulative distribution function called incomplete gamma function is defined as

$d \; =$ ___________.

a.) $x \qquad d \;;\quad 0$

b.) $\frac{}{\Gamma} \qquad ; \quad 0$

c.) $\frac{}{\Gamma} \; x \qquad d \;;\quad 0$

d.) $\frac{}{\Gamma} \; x \qquad d \;;\quad 0$

MATHEMATICAL STATISTICS-I

K2- level Questions

UNIT-1

1)Define discrete random variable.

A random variable that takes place at most a countable number of values is called discrete random variable.

2) Define distribution function:

Let X be a random variable ,the function F defined for all X by f(x)=p(X=x)

3) Define continuous random variable:

A random variable X is said to be continuous if it can take all possible values between obtain limits.

4) Write the symbolical notation for discrete distribution function:

F(x)=$\sum_{i \quad xi \quad x} pi$

pi≥0 ,$\sum_{i}^{\infty} \quad _{i}$

5) Define mathematical expectation:

The average values of a random phenomenon is termed as mathematical expectation of discrete random variables.

6) State generalisation of addition theorem:

The mathematical expectation of sum of n random variable is equal to the sum of their expectation provided all the expectation exists.

7) State generalisation of multiplication theorem:

The mathematical expectation of the product of number of independent random variable equal to their product of expectations.

8) Define co-variance:

If X and Y are two random variables, then co variance between them is defined as cov (x, y)=E(x ,y)-E(x)-E(y).

9) Write chebychev's Inequality theorem:

If x is a random variable , mean y and variance σ ,then for any positive integer k, we have probability

p{|x-μ|≥kσ}=1/ , p{|x-μ|<Kσ}≥-1-1/

10)Write the multiplication theorem for expectation:

If x and Y are independent random variable , then E(XY)=E(X)-E(Y)

UNIT-2

1)Define moment generating function:

The moment generating function of a random variable x having the probability function f(x) is given by M_x e x

2) Write the effect of change of origin and scale on moment generating function:

If u=x-a/h, then M M_x $-$ e—

3) Define the variance in M.G.F:

In M.G.F variance is equal to unity , v(z)=1 (i.e) mean and variance of a standard variant are “o” and “1” respectively.

4) Define cumulants:

Cumulants generating function x $log M_x$

5) Write relation between cumulants and variance:

Mean μ=k1 , variance μ2=k2, μ3=k3 , μ4=k4+3(k2)2

6) Define characteristic function:

A more serviceable function than the MGF is known as characteristic function and it is defined as ϕx(t)=E (e^i x

7) Define cumulant generating function:

Kx(t) in terms of ϕx(t) is given by kx(t)=log ϕx(t). Where

t $coefficien$ of $\frac{i}{!}$ in i e cumulan

8) Write the condition on effect of chance of origin and scale on cumulant distribution function:

If u=x-a/h , then $\emptyset^{x}$ e^{i}— ϕ −

9) Write the M.G.F , when the moments . if are 1 ! 2 :

$m_x(t)$ 1 − 2

10) Prove that M $_x$ M_x :

m_x e ^{x}

M $_x$ e ^{x} → 1

Mx(ct)=E e c → 2

From 1 and 2 , we get Mc M_x c

UNIT -3

1). Define probability mass function.

A random variable x is said to follow binomial distribution if it assumes iron negative values and its probability mass function is given by

$P(X = x) = p(x) = \{ {}_{ncx}\, p^r\, q^{n-r}$, r = 0,1,2.......

2). Define M.G.F of binomial distribution.

For a random variable x the M.G.F is given by

$M_{x(t)} = (q+pe^t)^n$

3). Write the renousky formulae.

$\mu_{r+1} = pq\,[nr\mu_{r-1} + d\mu_r/dp]$.

4). Write the first two moments of binomial distribution?

$\mu'_1 = np$

$\mu'_2 = np[(n-1)p+1]$.

5). Write the additive property of binomial distribution?

$M_{(x+y)} = M_x(t).\, M_y(t)$.

6). Write the uniqueness theorem of M.G.F?

The M.G.F of n distribution if it exists uniquely determined the distribution. This implies that corresponding to a given probability distribution there is only M.G.F and corresponding to the given M.G.F there is only one probability distribution.

7).define Poisson distribution.

A random variable x is said to follow poison distribution if its probability distribution function is given by

$P(X, \lambda) = P(X=x) = \{e^{-\lambda} \lambda^{x}/x!$

8). Write the first two moments of Poisson distribution?

$\mu_{1=\lambda}$

$\mu' 2 = \lambda^{2} + \lambda$

9). Write the M.G.F of Poisson distribution?

For a random variable x the M.G.F of Poisson distribution is given by

$M_{x(t) = e}\lambda(et-1)$

10). If p(x=1) = p(x=2) and p(y=2) = p(y=y) then v(x-2y) =

V(x-2y) = 1i4.

UNIT-4

1. Define normal distribution.

A random variable ,X is said to have a normal distribution with parameters μ and σ^2 which is given by: $f(x,y) = 1/\sigma\sqrt{2n}\, e^{-}(x-\mu)^{2}/2\sigma^{2}$.

2. Write the importance of normal distribution.

Distribution occurring in practise binomial hyper , geometric distribution etc., can be approximated by normal distribution.

3. Write two chief characteristic of normal distribution.

*The curve is both shaped and symmetrical about the line x=μ

* Mean , Median ,Mode of the distribution coincide

4. Write M.G.F of normal distribution.

$M_x(t) = e^{\mu t} + t^{2}\sigma^{2}/2$

5. Cumulative generating function of normal distribution.

$K_{(x)}(t) = \mu t + (\quad)\sigma^2/2$

6. M.G.F of normal distribution about mean

M.G.F = $e^{-\mu t}.e(\mu t+t^2\sigma^{2)}/2$

7. Mean deviation about mean for normal distribution.

4/5 σ

8. Define rectangular distribution.

When it is over the interval (a,b) is given by:$f(x_i,a,b)= \{1/b-a\ ,a<x<b$

9. Mean of rectangular distribution.

If X ~ (a,b) ,then the mean is a+b/2

10. M.G.F of rectangular distribution

$M_{(x)}(t) = 1/b-a\ [e^{bt} – e^{at}]/t$

UNIT-5

1.Define gamma distribution.

A random variable is said to be have normal distribution with parameters $\alpha >0$.

2. M.G.F of gamma distribution

$M_{(x)}(t) = (1- t)^{-\alpha}$

3. Cumulant of gamma distribution

$K_{(x)}(t) = \log (m_x(t))$

4. What is the mean of gamma ?

The mean is lambda.

5. What is the variance of gamma distribution?

The variance of gamma distribution is $V(x) = \alpha$

6. Symbolic notation of additive property of gamma

$M_{(x_1+x_2+.....+x_n) =} M_{X1}(t).M_{x2}(t)......M_{xn}(t)$

7. Define beta distribution of first kind.

$F(x) = \{1/\beta(\mu,v).\ x^{\mu-1}\,(1-x)^{v-1}$

8. Harmonic mean of gamma

$H = \mu-1/\mu+v+1$

9. Exponential distribution –define.

$F(x,\Theta) = \{\Theta \,.\, e^{-x\Theta}\,;x\geq 0$

10.M.G.F of exponential distribution

$M_{(x)}(t) = \Theta/\Theta\text{-}t$,Θ is the parameter .

MATHEMATICAL STATISTICS-I

K3 LEVEL QUESTIONS

UNIT- 1

1) State and prove addition theorem for expectation

2) State and prove multiplication theorem for expectation

3) Let X be a random variable with the following distribution

x	-3	6	9
P(X=x)	1/6	½	1/5

4) Let X be a random variable with probability distribution is given by

X	0	1	2
P(x=x)	5/16	10/16	1/16

Find the expected value and variance

5) Find the expectation of number of the dies when thrown

6) Two unbiased dies are thrown. Find the expected value of sum of the number of points on it

7) Let the random variable have the following distribution P(X=0)=p,

P(X=1)=1-2p,P(X=2)=p,0≤p≤1/2,for what p, V(x) is a maximum

8) A symbolic dice is thrown 600 times. Find the lower board for probability of getting 80 to 120 times.

9) A bog contains a white a ball , and b black balls if c balls are drawn at random find the expected value of number of white balls thrown

10) Prove that $V(ax+b)=a^2(v(x))$.

UNIT- 2

11) Effect of change of origin and scale on moment generating function;
12) State and prove additive properties of cumulants;
13) Effect of change of origin and scale on cumulants;
14) If the moments of variate x are defined by E (x^r)=0.6, r=1,2,3,…. Then show that p(x=0)=0.4, p(x=1)=0.6, p(x=r)=0, r=1,2,3,….
15) In the distribution function of a random variable x is symmetrical about (origin) zero (i.e.) if 1-F(x)=F(-x)
=>f(-x) = f(x)
Then ϕ (t) is a real valued and even function of 't'
16) If x is a random variable with characteristic function ϕ (t) and if μ'_r=E (x^r) exists then
$\mu'_r = -\ ^{r} \left| \frac{\partial r}{\partial} \phi(t) \right|$

17) Effect of change of origin and scale on characteristic function;

18) ϕ (t) and ϕ (-t) are conjugate functions, (i.e.) ϕ (-t) = ϕ where is the complex conjugate of a;

19) Find ϕ(t) is continuous everywhere (i.e.) ϕ(t) is continuous function of 't' in (-∞,∞) rather ϕ(t) is uniformly continuous 't'

20) Find the MGF of the random variable x whose moments are

μ'_r =(r+1)!2^r

UNIT- 3

21) Comment on the following .The mean of the binomial distribution is 3 and variance is 4.
22) Derive the moment generating function of poison distribution.
23) If x and y are independent variate such that p(x=1) =p(x=2)and p(y=2)=p(z=3).Find the variance of (x-2y).
24) In a book of 520 pages 390 pages typographical errors occur assuming Poisson law for number of errors, per page .Find the probability that a random sample of 5 pages will contain no errors.
25) Six coins are tossed 6400 times in Poisson distribution .Find the approximate probability of getting six heads **r** times.
26) 10 coins are thrown simultaneously .Find the probability of getting at least seven heads.
27) What is the physical condition for binomial distribution?
28) Derive the Renousky formula.
29) With the useful rotations find P for binomial variable x if n=6 and 9p(x=4)=p(x=2).
30) Define binomial and Poisson distribution.

UNIT- 4

31. Define rectangular distribution. Find mean and variance of Rectangular distribution.

32. X is normally distributed and the mean of x is 12 and s.d is 4 find the probability of following i) $x \geq 20$ ii)x 20 iii) $0 \leq x \leq 12$.

33. Define normal distribution. Find MGF of normal distribution about origin.

34. If X is uniformly distributed with mean 1 and variance 4/3.Find $p(x>0)$.

35. Find the moments of rectangular distribution.

36. The marks obtained by a no. of students for a certain subjects are approximately normally distributed with 65 and S.D. of 5. If 3 students are taken at random from this set, what is the probability that exactly 2 of them will have marks over 70?

37. Derive the cumulant generating function of normal distribution.

38. Derive the MGF of rectangular distribution.

39. Find the moments of normal distribution.

40. A sample of 100 items is taken at random from a batch known to contain 40% defectives. What is the probability that the sample contains (i) atleast 44 defectives.(ii) exactly 44 defectives.

UNIT- 5

41. Find MGF of gamma distribution.

42. Additive property of gamma distribution.

43. Find the cumulants of gamma distribution.

44. In a distribution exactly normal 10.03% of the item are under 25 k.g weight and 89.97% of the items are under 70 k.g weight what are the mean and s.d of the distribution.

45. There are 600 economic students in post graduate in classes of a university and the probability for any students to need a copy of a particular book from the university library on any day is 0.05 How many copies of books should be kept in university library so that the probability may be >0.90 that the probability that noe of the student needing a copy from the library has to come back misappropriated.

46. Find MGF of exponential distribution.

47. Find cumulants of standard normal variate.

48. Find MGF of normal Variate.

49. X is a normal variate with mean 30 and s.d is 5. Find the probability that,

a.) $26 \leq x \leq 40$ b.) $x \geq 45$ c.) $|x-30|>5$

50. Prove that for the normal distribution, the quartile deviation, the mean deviation and the s.d are approximately 10:12:15 .

MATHEMATICAL STATISTICS-I

K4 LEVEL QUESTIONS

UNIT- 1

1) State and prove generalisation of addition theorem
2) State and prove generalisation of multiplication therom
3) In a sequence of bernouli trial test let x be the length of run either success or failure . starting with the first trail E(x) and V(y)
4) State and prove chebychevs inequality
5) For geometric distribution $P(x)=2^{-x}$, x=1,2,3……prove that chebychevs inequality give $P(|x-2|\leq 2)\geq 1/2$. Write the autual probability is 15/16 .

UNIT- 2

6) Obtain the relation between cumulants and moments;
7) Let the random variable x assume the value k , with the probability law find the moment generating function of x. hence its mean and variance p(x=r) = ^{1}.p,r=1,2,3,…..
8) The probability density function of the random variable x follows the probability law;

   $P(x)=\frac{1}{\ } \exp\left(-\frac{|\quad|}{\ }\right), -\infty<x<\infty$

   Find MGF of x, hence or otherwise find E(x) and V(x)

9) Properties of moment generating function;

10) If $|\phi(s)|=1$ for same $s\neq 0$ then for some 'a', 'x-a' is a lattice variance with mesh $h=\frac{\ }{|\ |}$;

UNIT- 3

11) Derive the Moment generating function of binomial distribution.
12) Explain the first four moments of binomial distribution.
13) Manufacture of cotter pine knows that 5 percent of this product is defective. If he sells cotter pine in box of 100 and guaranty that not more than 10 pins will be defective what is approximate probability that a box will fail to meet the guaranteed quality?
14) Car hire firm has two cars which it hires but day to day .The number of demands for a car on each day is distributed as a poison distribution with mean 1.5 . calculate the proportion of days on which

    i) Neither a car as used

    ii) Proportion of days on which same demands is refused.

15) The mean and variance of binomial distribution are 4 and 4/3. Find $p(x \geq 1)$.

UNIT- 4

16. Explain the chief characteristics of the normal distribution and the normal probability curves.

17. The man yield for one acre plot is 662 kilos with a s.d. of 32 kilos. Assuming normal distribution, how many one acre plots in a batch of 1000 plots would you expect to have yield (I) over 700 kilos (ii)Below 650 kilos and (iii)what is the lowest yield of the best 100 plots.

18. If the skull are classified as A,B,C according to the length breadth and Index is under 75 and 80 or over 80,find approximately the mean and s.d. of a series in which A are 58%, B are 38%and C are 4% being given that if

$f(t)=1/\sqrt{(2\pi}\int exp(-x^2/2).dx.$

then f(0.20)=0.08 and f(1.75)=0.46.

19. Define rectangular distribution and derive its moments and MGF.

20. Obtain the equation of the normal curve that may be fitted to the

Normal curve.

Class	60-65	65-70	70-75	75-80	80-85	85-90	90-95	95-100
Frequency	3	21	15	335	326	135	26	4

Also obtain expected normal frequency.

UNIT- 5

21. Find the cumulants of gamma distribution and compare its coefficient.

22. Derive the beta distribution of first kind.

23. Find the cumulants of standard normal variate.

24. Derive the beta distribution of second kind.

25. In a distribution exactly normal 10.03% of the items are undue 25kg weight and 89.97% of the items are under 70kg weight. What are the mean and s.d of the distribution?