2014

Statistics - II

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

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

GROUP - A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following: **10x1=10**

i) If $P(A)=\frac{1}{3}, P(B)=\frac{1}{9}, P(A\cup B)=\frac{1}{6}$ then the value of $P(A\cap B)$ is

a) $\frac{4}{9}$

b) 1

c) $\frac{5}{6}$

d) $\frac{5}{18}$

ii) If 3 dice are thrown simultaneously, the total number of possible outcomes are

a) 18
b) 216
c) 36
d) None of these

iii) For which distribution mean median & mode are same?

a) Normal
b) Binomial
c) Poisson
d) none of these

iv) If the r.v X has exponential distribution with parameter λ, then the mean and variance are respectively

a) $\frac{1}{\lambda} and \frac{1}{\lambda^2}$

b) $\frac{1}{\lambda} and \left(\frac{1}{\lambda}-1\right)$

c) $\frac{1}{\lambda} and \frac{1}{\lambda^2}$

d) None of these

v) If X and Y are two independent variable then Cov(X,Y) is

a) 0
b) 1
c) 2
d) None

vi) Type one error will occur if

a) true H_0 is rejected

b) true H_0 is accepted

c) false H_0 is rejected

d) None

vii) If $X_1, X_2, X_3, \ldots\ldots X_n$ be the sample drawn from normal population With mean μ and standard deviation (s.d) σ, then the maximum likelihood Estimator (M.L.E) of μ is

a) Sample mean b) population mean

c) no. of observation. d) None of these

viii) What is the probability that a leap year will contain 53 Sundays?

a) 1/7

b) 2/7

c) 5/7

d) None of these

ix) A box contains 6 white & 4 black balls. One ball is drawn at random; the probability that it is black is...

a) 1/5

b) 3/5

c) 4/5

d) 2/5.

x) Standard Error of a sample proportion under SRSWOR is:

a) $\sqrt{\frac{PQ}{n}}\sqrt{\frac{N-n}{N-1}}$

b) $\sqrt{\frac{PQ}{n}}$

c) $\sqrt{\frac{N-n}{N-1}}$

d) $\sqrt{\frac{PQ}{n}} / \sqrt{\frac{N-n}{N-1}}$

where symbols have usual meanings.

xi) The level of significance in hypothesis testing is the probability of

a) accepting a true null hypothesis

b) accepting a false null hypothesis

c) rejecting a true null hypothesis

d) None of these alternatives is correct.

xii) 993 people were asked what their favorite type of TV programme was: News, Documentary, Sports. They could only chose 1 answer. As such, the researcher had the number of people who chose each category of program. How should they analyze these data?

a) T - test

b) One - way analysis of variance

c) Regression

d) Chi - square test

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. 3x5=15

2. In a shooting competition, the probability of a man hitting the target is 1/5. If he fires 5 times, what is the probability of hitting the target at least twice?

3. The probability that a student Mr. X passes mathematics is 2/3, the Probability that he passes statistics is 4/9. If the probability of passing At least one subject is 4/5, what is the probability that Mr. X will pass both the subjects.

4. If a random variable X has mean μ and standard deviation σ, show that $E\left(\frac{X-\mu}{\sigma}\right)=0; E\left(\frac{X-\mu}{\sigma}\right)^2=1$

5. A random sample of the height of 100 students from a large population of students is drawn. The average height of the students in the sample is 5.6 feet while S.D is 0.75 feet. Find 95% confidence limits for the average height of all the students in the population.

6. A sample of 3 observations,($X_1 = 0.4$, $X_2 = 0.7$, $X_3 = 0.9$) is collected from a continuous distribution with density.

   $f(x)=\theta x^{\theta-1}$ for $0<x<1$

   Estimate θ by the method of maximum likelihood.

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. 3x15=45

7. a) The probability that Ashok can solve a problem is $\frac{4}{5}$, that Amol can solve is $\frac{2}{3}$ and that Abdul can solve is $\frac{3}{7}$. If all them try independently, find the probability that the problem will be solved.

   b) If A and B are independent events and $P(A)=\frac{2}{3}, P(B)=\frac{3}{5}$, find $P(A+B), P(A^c/B)$ and $P(A^cB)$

   c) State and prove Baye's Theorem.

   5+5+5

8. a) The joint probability distribution of the random variables X and Y is shown below:

X/Y	2	1	5
2	0.05	0.23	0.26
3	0.18	0.50	0.20
6	0.8	0.10	0.35

Find

i) the conditional distribution of X.

ii) the conditional distribution of Y.

iii) the probability P(X+Y>5)

b) If X is a random variable then prove that $V(aX+b)=a^2+V(X)$

c) X is a discrete random variable having probability mass function:

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

Determine the constant k; (ii) Find P(X<6)

6+4+5

9. a) The probability density function (p.d.f) of a random variate is given that

Y=k(X-2) (3-X); $2 \le X \le 3$.

Find

(i) the value of constant k. (ii) the c.d.f (iii) $P(X \le 5/2)$ (iv) $P(X \ge 5/2)$.

b) The marks obtained in certain examination follow normal distribution with mean 45 and standard deviation 10. If 1000 students appeared at the examination, calculate the number of students scoring (i) less than 40 marks and (ii) more than 40 marks.

8+7

10. a) The length of life X (in hours) of a certain electronic component is assumed to follow a continuous distribution with density function $f(x) = \frac{k}{x^3}; (1000 \le x \le 1500)$

Determine the constant 'k' and find the probability that a component selected at random will function for at least 1200 hours.

b) If T and P be two statistics with expectations $E(T) = 2.\theta_1+3.\theta_2$

and $E(P) = \theta_1 + \theta_2$, find unbiased estimators for the parameters θ_1, θ_2.

c) Write short notes on random sampling and non random sampling.

5+5+5

11. a) The following figures shows the distribution of digits in numbers chosen at random from a telephone directory:

digits:	0	1	2	3	4	5
frequency:	1026	1107	997	966	1075	933
digits:	6	7	8	9	Total	
frequency:	1107	972	964	853	10,000	

Test whether the digit may be taken to occur equally frequently in the directory.

b) Use Neyman-Pearson lemma to obtain the best critical region for testing

$H_0 : \emptyset = \emptyset_0$ against $H_1 : \emptyset = \emptyset > \emptyset_0$, in the case of a normal population $N(\emptyset, \sigma^2)$, where σ^2 is known.

8+7