

[2½ Hours]

[Marks: 75]

- N.B. 1) All questions are compulsory.
 2) Figures to the right indicate marks.
 3) Illustrations, in –depth answers and diagram will be appreciated.
 4) Mixing of sub-questions is not allowed.
 5) Use of own non-programmable calculator is allowed.

Q.1 Attempt all the questions (Each of 5 marks)**(15)****(a) Multiple Choices questions.****(05)**

- (i) A variable which assigns real value to the elements of sample space is called as....
 a) Random number b) Random variable c) Variable d) none of the above
- (ii) Binomial distribution is two parameters distribution.
 a) two b) three c) four d) none of the above
- (iii) The Critical region is region of
 a) Acceptance b) Total area below the curve c) Rejection d) none of the above
- (iv) In statistics, the assumption about the problem is called as
 a) Comment b) Hypothesis c) Statement d) none of the above
- (v) is not a parametric test
 a) t-test b) z-test for proportion comparison c) ANOVA d) all the above

(b) Fill in the blanks.**(05)**

- (i) If $x: 2, 3, 4$ with probabilities $p(x): 0.3, 0.4, 0.3$ then $E(x) = \dots\dots\dots$
- (ii) The mean and variance of standard normal variate is
- (iii) If level of significance is 5% then the Confidence interval is
- (iv) If null hypothesis is true and if it is rejected then error is committed.
- (v) A sequence of same type of / identical symbol constitute

(c) Short answers.**(05)**

- (i) Define discrete random variable.
- (ii) State two properties of chi square distribution.
- (iii) State the criterion of rejection at 5% level of significance in case of calculated and tabulated value.
- (iv) Define level of significance.
- (v) State the use of Kruskal-Wallis test.

Q.2 Attempt any three.**(15)**

- (a) A coin is tossed three times, let the random variable X denotes number of heads, find the probability distribution and hence find $E(X)$ and $V(X)$.
- (b) Write a short note on cumulative distribution function (C.D.F.).
- (c) Define variance. With usual notations show that $E(aX + b) = aE(X) + b$ and $V(aX + b) = a^2V(X)$.
- (d) A basket contains 20 good oranges and 80 bad oranges. 3 oranges are drawn at random from this basket. Find the probability that out of 3
 i) Exactly 2 are good ii) At least 2 are good iii) At most 2 are good oranges
 (Solve using binomial distribution)
- (e) Define standard normal variate. For standard normal variable Z , show the following using normal curve
 i) area to the left of $Z=a$ ii) area in between of $Z= -b$ and $Z=a$ iii) area to the left of $Z= -b$
- (f) Define t-distribution. Write the properties of t-distribution.

Q.3

Attempt any three.

(15)

- (a) Explain in detail types of errors in the procedure of testing of hypothesis. Also comment on power of the test.
- (b) In detail explain the procedure of testing the two population means using z-test.
- (c) The class test is conducted for the 10 students and their marks are listed below:
50, 49, 52, 44, 45, 48, 46, 45, 49, 45

Test if the average marks of the students can be taken to be 50. Also calculate 95% confidence interval for the mean. (*the table value for the comparison is 2.262*)

- (d) Two random samples are drawn from two normal populations are:

Sample I	18	22	27	25	35	30	28	25	27	30	30
Sample II	27	33	32	26	29	38	20	27	33	28	30

Obtain the estimate of the variance and test whether two populations have same variance or not. (**F statistics table value for the comparison is 3.10**)

- (e) A special type of fertilizer was used in four agricultural fields A, B, C and D. Each field was divided into four beds and the fertilizers were applied over the time. The respective yields of the four beds are given below: Perform ANOVA and present your results in ANOVA table.

A	18	22	12	19
B	19	24	17	11
C	13	28	12	15
D	13	27	18	12

- (f) Explain the procedure of obtaining various sums of squares in two way ANOVA. Also give the sample two way ANOVA table.

Q.4

Attempt any three.

(15)

- (a) State the difference between parametric and Non-Parametric tests. Also state merits of non-parametric tests over parametric test.
- (b) Explain the procedure of sign test in detail.
- (c) What is post-hoc analysis? Explain Duncan's multiple range test.
- (d) Test whether the preference given in choosing investment plans are independent of the sex of an employee

	Investment options		
	NSC	PPF	Bonds
Male	36	24	20
Female	45	20	15

(*chi-square test table value at 2 degrees of freedom is 5.991*)

- (e) A random sample of 10 infants showed the following pulse rate per minute: 110, 121, 125, 122, 112, 117, 129, 114, 124, 127. Using Wilcoxon signed rank test, verify whether the median pulse rate of infants is more than 120 beats per minute.

(*given table value is 10*)

- (f) Solve using Kruskal-wallis test

A	44	45	46	47	48	49
B	40	42	51	52	55	
C	50	53	58	59		

Q.5

Attempt any three.

(15)

- (a) State the properties of p.d.f and Verify whether the following functions are p.d.f.
 $f(x) = 2x;$ for $0 < x < 1$
 $= 0;$ otherwise
- (b) Define normal distribution. Write the properties of Normal distribution.
- (c) Write the procedure of testing of hypothesis.
- (d) The following data of Success(S) and Failure (F) was recorded for certain experiment. Use run test at 5% I.o.s. to check if the arrangement given in a sequence of success and failure is random or not. (Use normal approximation)
SFSFSFSSFSFSFSSSFSFSSSSFFFSFFSSFFSSSSFSFSFS
(Standard value of for comparison is 1.96)
- (e) Write a short note on Yate's correction procedure in chi-square.
