

- 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) Normal distribution isnature
a) Symmetric distribution b) Skewed c) Kurtic d) none of the above
- (iii) The Confidence region is region of
a) Acceptance b) Total area below the curve c) Rejection d) none of the above
- (iv) The maximum probability of committing type I error is called as
a) Confidence level b) Power of the test c) Level of significance d) none of the above.
- (v) A sequence of same type of / identical symbol constitute
a) Runs b) sign c) rank d) none of the above

(b) Fill in the blanks. (05)

- (i) If $x: 3, 3, 3$ with probabilities $p(x): - 0.3, 0.4, 0.3$ then $V(x) = \dots$
- (ii) If $F(X)$ is c.d.f. then $F(X)$ is (choose from non-decreasing, non-increasing, decreasing)
- (iii) If level of significance is 1% then the Confidence interval is
- (iv) The probability of not committing type II error is called as..... (choose from level of significance, power of the test)
- (v) If in case of calculated value of test statistics is greater than that of tabulated value for t-test then null hypothesis is (choose from rejected, accepted)

(c) Short answers. (05)

- (i) Define continuous random variable.
- (ii) State two properties of chi-square distribution.
- (iii) State the criterion of rejection at 5% level of significance in case if p-value is given.
- (iv) Define level of significance.
- (v) What is large sample and small sample?

Q.2 Attempt any three. (15)

(a) Define:

- i) Discrete random variable.
ii) Probability mass function and Probability density function.

(b) If two six face dice are tossed simultaneously and if random variable X denotes the sum on the top of the faces of the dice then find the probability distribution and hence find $E(X)$ and $V(X)$

(c) Write a short note on cumulative distribution function (C.D.F.).

(d) The mean and variance of binomial variate are 12 and 6.
Find i) $P(X=0)$ ii) $P(X \geq 1)$.

- (e) Define standard normal variate. For standard normal variable Z , show the following using normal curve
 i) area to the right of $Z=a$ ii) area in between of $Z=-b$ and $Z=a$ iii) area to the left of $Z=-b$
- (f) Define F-distribution. Write the properties of F-distribution

Q.3

Attempt any three.

(15)

- (a) Explain in detail types of errors in the procedure of testing of hypothesis. Also comment on level of significance and power of the test.
- (b) Define Null and alternate hypothesis and write steps of testing of hypothesis.
- (c) The sales data of an item in six shops before and after a special promotional campaign are as given below:

Shops	A	B	C	D	E	F
Before	48	32	27	29	35	45
After	55	54	34	28	38	43

Can we say that the campaigning effectively increased the sales? Test at 5%.

(The table value at 5% is 2.015)

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

A	66	67	75	76	82	84	88	90	92		
B	64	66	74	78	82	85	87	92	93	95	97

Obtain the estimate of the variance and test whether two populations have same variance or not. (F statistics table value at 5% for the comparison is 3.05)

- (e) The following data on temperature in degree Celsius is collected from the four parts of the state at five different time points. Perform ANOVA and present your results in ANOVA table.

P1	28	32	38	33	26
P2	22	28	35	27	23
P3	30	34	37	34	28
P4	30	35	41	37	30

- (f) Explain the procedure of obtaining various sums of squares in two ways 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 run test in detail.
- (c) What is post-hoc analysis? Explain Duncan's multiple range test.
- (d) The 2 X 3 contingency represent the distribution of education level and sex in one of the village of the state. Test whether the education is independent of sex.

	SSC	HSC	Graduate and others
Male	220	280	350
Female	300	340	370

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

- (e) Ten randomly chosen models went on a diet in an attempt to lose weight (in Kgs) with following results:

Before	55	58	60	57	65	56	59	60	56	53
After	48	50	55	58	59	58	50	55	56	55

Use sign test and check if the diet is an effective means of losing weight. (given table value is 1)

