M – 2018

2210490

Subject Code : 31 (NS)

STATISTICS

(Kannada and English Versions)

Time : 3 Hours 15 Minutes] [Total No. of questions : 44] [Max. Marks : 100

(English Version)

Instructions : 1. *Statistical table and graph sheets will be supplied on request.*

2. *Scientific calculators may be used.*

3. *All working steps should be clearly shown.*

SECTION – A

I. Answer **any ten** of the following questions : **(10 × 1 = 10)**

1) Define Cohort.

2) What is the value of Index Number for the base year?

3) Which weights are used in the construction of Laspeyre's Price Index Number?

4) What is Time Series?

5) Under what condition Poisson distribution tends to Normal distribution?

6) Write the range of a Chi-square distribution.

7) Which is the best estimator of population mean?

8) What is parameter space?

9) In Statistical Hypothesis, if $H_1 : \mu < 50\,\text{kg}$ then write H_0.

10) What is meant by Statistical Quality Control?

11) What is feasible region (FR) in LPP?

12) When is a Transportation Problem (TP) balanced?

SECTION – B

(10 × 2 = 20)

II. Answer **any ten** of the following questions :

13) Mention the methods of collecting Vital Statistics.

14) Write any two limitations of Index Number.

15) For the following data compute Value Index Number :
$\Sigma p_0 q_0 = 300$ and $\Sigma p_1 q_1 = 375$.

16) From the following Time Series data, calculate trends values by the method of Semi-Averages.

Years :	2011	2012	2013	2014	2015	2016
Profit (Rs. '000) :	22	21	23	22	24	26

17) Define Interpolation and Extrapolation.

18) Write down the Bernoulli distribution with parameter $p = 0.4$.

19) State any two features of student *t*-distribution.

20) Define Point estimation and Interval estimation.

21) If $n_1 = 40$, $n_2 = 60$, $p_1 = 0.02$ and $p_2 = 0.01$ then find S.E. $(p_1 - p_2)$.

22) What do you mean by Process control and Product control?

23) The objective function and two solutions of an LPP are Max $Z = 5X + 4Y$ and $A(12, 10)$; $B(14, 4)$. Find the optimal solution.

24) From the following Transportation Problem test whether solution is degenerate.

30 2	10 5	
	30 3	
		20 1

SECTION – C

III. Answer **any eight** of the following questions : **(8 × 5 = 40)**

25) From the following data calculate Crude Birth Rate (CBR) and General Fertility Rate (GFR).

Age group (in years)	Population		Number of Live Births
	Males	Females	
0 – 14	12,000	12,120	0
15 – 19	9,400	9,700	196
20 – 29	14,500	14,300	460
30 – 39	6,000	7,200	384
40 – 49	5,000	4,300	230
50 – 69	4,000	5,000	0
70 and above	3,100	3,200	0

26) Calculate Un-weighted geometric mean price index number for the following data.

Items	*A*	*B*	*C*	*D*	*E*
Prices (Rs.) 2014	120	40	100	100	300
Prices (Rs.) 2016	220	80	300	200	500

27) What is Consumer Price Index Number (CPI)? Write its four uses.

28) Compute the trend values by finding 3 yearly moving averages for the following data.

Years :	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Sales ('000) :	85	90	87	95	105	100	90	99	103	110

29) Interpolate and Extrapolate the population of India for the census years 1981 and 2021 from the following data.

Census Year :	1961	1971	1981	1991	2001	2011	2021
Population (Crores) :	44	55	–	84	103	122	–

30) The number of accidents in a year attributed to taxi drivers in a city follows Poisson distribution with mean 2.5. Out of 2000 taxi drivers, find approximately the number of drivers with

a) one accident

b) more than 2 accidents in a year.

31) In a Hyper Geometric distribution, if $a = 6$, $b = 9$ and $n = 4$ then find

a) $P(X = 2)$

b) Standard Deviation.

32) A manufacturer claims that less than 2% of the products are defective. A retailer buys a batch of 400 products from the manufacturer and find that 12 are defectives. Test at 1% level of significance that whether the manufacturer claims is justifiable.

33) A random sample of size 16 has mean 53. The sum of the squared deviations taken from mean is 150. Can this sample be regarded as taken from the population having mean 56? ($K = \pm 2.13$)

34) Ten samples of size 50 each were inspected and the number of defectives in each of them were as follows.

Sample Number :	1	2	3	4	5	6	7	8	9	10
Number of defectives :	0	2	3	1	2	3	0	1	2	1

Obtain the control limits for *np*-chart.

35) Solve the following game by Maxi-min and Mini-max principle. Is game fair?

		Player-B			
		B_1	B_2	B_3	B_4
Player-A	A_1	3	2	0	6
	A_2	−1	−3	0	−1
	A_3	−3	4	−3	0

36) The capital cost of a machine is Rs. 10,500. Its resale value is Rs. 500. The maintenance costs are as follows.

Years :	1	2	3	4	5	6
Maintenance cost (Rs.) :	800	1000	1500	2200	2800	3900

When should the machine be replaced?

SECTION – D

IV. Answer **any two** of the following questions : **(2 × 10 = 20)**

37) a) From the following data show that Town-*A* is healthier.

Age group (in years)	Deaths per 1000		Standard population
	Town-*A*	Town-*B*	
0 – 9	10	12	35,000
10 – 29	18	20	15,000
30 – 59	20	24	20,000
60 and above	15	18	30,000

b) Compute the Gross Reproduction Rate (GRR) from the following data.

Age group (in years)	Female Population	Female Births
15 – 19	1600	20
20 – 24	1100	77
25 – 29	1700	102
30 – 34	1600	70
35 – 39	1600	30
40 – 44	1500	15
45 – 49	1400	14

38) Compute Fisher's Price Index Number. Show that Fisher's Index Number satisfies TRT and FRT.

Items	2015		2016	
	Price (Rs.)	Quantity	Price (Rs.)	Quantity
A	14	8	15	10
B	9	20	8	25
C	20	6	22	9
D	25	5	30	8

39) Fit a parabolic trend of the form $Y = a + bX + cX^2$ for the following Time Series.

Years :	2008	2010	2012	2014	2016
Value :	29	25	22	20	19

40) Fit a Binomial distribution for the following data and test at 5% level of significance that Binomial distribution is a good fit.

No. of defective items :	0	1	2	3	4	5
No. of samples :	1	16	48	68	51	16

SECTION – E

V. Answer **any two** of the following questions : **(2 × 5 = 10)**

41) X is a normal variate with parameters mean $(\mu) = 50$ and variance $(\sigma^2) = 16$. Find the probability that

a) $X < 56$

b) $52 < X < 55$.

42) From the following data regarding average weight of boys and girls. Test whether the mean weight of boys are greater than mean weight of girls.

Sample	Boys	Girls
Mean	63 kg	60 kg
Variance	64 kg^2	144 kg^2
Size	64	48

43) To test the effectiveness of vaccination against Tuberculosis (TB) and following data was obtained.

	Attacked	Not attacked
Inoculated	12	26
Not inoculated	16	6

Test at 1% level of significance whether vaccination and attack of TB are independent.

44) The annual demand for an item is 3000 units. Capital cost is Rs. 7 per unit. Inventory carrying cost is 20% of capital cost per annum. If setup cost is Rs. 150 then find

a) Economic Order Quantity and

b) Optimum number of orders.
