

Shivaji University, Kolhapur

Question Bank for Mar-2022 (summer) Examination

Subject Code: 63124

Subject Name: **Business Statistics Paper- II**

Short Answer Questions (5 marks each)

Probability and Probability distributions

1. If the mean and standard deviation of Binomial random variable are 16 and 2 respectively, find values of the parameters n and p .
2. If $P(\bar{A}) = 0.4$ and $P(\bar{B}) = 0.7$, find the $P(A \cup B)$ if
 - i) A and B are mutually exclusive events
 - ii) A and B are independent events.
3. If $P(A) = 0.7$, $P(\bar{B}) = 0.6$ and $P(A \cap B) = 0.3$, find:
 - i) $P(A \cup B)$
 - ii) $P(\bar{A})$
 - iii) $P(A/B)$
 - iv) $P(B/A)$
4. If $P(A) = 0.4$, $P(\bar{B}) = 0.5$ and $P(A \cap B) = 0.2$, find:
 - i) $P(\bar{A})$
 - ii) $P(B)$
 - iii) $P(A/B)$
5. State probability mass function (p. m. f.) Binomial distribution. If mean and variance of Binomial distribution are 6 and $3/2$ respectively, find its parameters.
6. If first and third quartiles of the normal distribution are 70 and 40, find its mean and variance.
7. Explain the terms: Mutually Exclusive events and Exhaustive events.
8. State any five properties of Normal probability curve.

Time series

9. Explain 'cyclical variations' in the time series.
10. Write a note on "Secular Trend" in the time series.
11. Explain the "random variations" in the time series.
12. Distinguish between seasonal and cyclical variations.
13. Write a note on "seasonal variations" in the time series.

Index Numbers

14. Compute the simple aggregate index number from the following data and comment on it.

Commodity	A	B	C	D	E
Price (in Rs) in 2018	200	240	310	140	90
Price (in Rs) in 2020	220	210	350	160	100

15. State the relationship between Laspeyre's, Paasche's and Fishers' price index numbers. Find the Laspeyre's Price index number if Paasche's and Fisher's price index numbers are 164 and 168 respectively.

16. Compute price index number by simple aggregate method from the following data:

Commodity	A	B	C	D	E	F
Price (in 2015)	60	50	60	50	25	20
Price (in 2018)	80	60	72	75	37.5	30

17. Compute price index number by using average of price relative method from the following data:

Commodity	A	B	C	D
Price (in 2015)	40	50	20	10
Price (in 2018)	70	65	30	30

Statistical Quality Control (S. Q. C.)

18. Distinguish between chance causes and assignable causes of variations.

19. Explain the terms: Process Control and Product Control.

20. State advantages of Statistical Quality Control (S.Q.C.)

Long Answer Questions (10 marks each)

Probability

- Explain the terms: Mutually Exclusive events and Exhaustive events. State the addition theorem of probability. If $P(A) = 0.4$, $P(\bar{B}) = 0.5$ and $P(A \cap B) = 0.2$, find: i) $P(\bar{A})$ ii) $P(B)$
iii) $P(A/B)$ iv) $P(B/A)$ v) $P(A \cup B)$
- Explain the terms with suitable example: Mutually Exclusive Events and Independent Events. An urn contains 10 white and 5 black balls. Two balls are drawn from the urn without replacement. Find the probability that i) both the balls will be of same colour, ii) balls will of different colours.
- For any two events, define conditional probability of A given B. If $P(A) = 0.6$, $P(B) = 0.4$ and $P(A \cup B) = 0.4$, find: i) $P(A \cap B)$ ii) $P(A/B)$ iii) $P(B/A)$ iv) $P(\bar{A} \cap \bar{B})$ v) $P(\bar{A}/\bar{B})$
- Define probability of an event A. A box contains 20 tickets, numbered 1 to 20. A ticket is drawn at random from the box. Find the probability that a number on the ticket will be:
i) a multiple of 3 ii) a multiple of 5 iii) a multiple of 3 or 5 and iv) a multiple of 3 and 5.

5. State addition theorem of probability for two events. A card is drawn from a pack of well-shuffled pack of 52 playing cards, find the probability that card drawn will be:
- i) a black card ii) a red card iii) a picture card and iv) a red king.

Probability distributions

6. Give probability density function (p. d. f.) of Normal distribution. State its mean and variance. If weights (in kg) of 1000 students were found to be normally distributed with mean weight 45 kg and standard deviation 3 kg, Find the number of students with weights (i) less than 39 kg (ii) more than 48 kg and (iii) in between 39 to 48 kg. (*Given Area under curve for S.N.V. from $Z = 0$ to $Z = 1$ is 0.3413, from $Z = 1$ to $Z = 2$ is 0.1359*)
7. State any four properties of normal probability curve. Using sketch of Standard Normal probability curve, show area under the curve for the following events (separate sketch for each event):
- i) $Z \geq 1$ ii) $Z \leq -1$ iii) $-1 \leq Z \leq 1$ iv) $Z < 2$ v) $Z \geq 2$ or $Z \leq -2$
8. Define Standard normal distribution. State the properties of the normal probability curve. If X is normally distributed with mean 45 and standard deviation 4, find
- i) $P(X \leq 53)$ ii) $P(X \geq 41)$ and iii) $P(40 \leq X \leq 50)$
- (*Given Area under curve for S.N.V. from $Z = 0$ to $Z = 1$ is 0.3413, from $Z = 1$ to $Z = 2$ is 0.1359 and from $Z = 0$ to $Z = 1.25$ is 0.3944*)
9. State the properties of normal probability curve. The income distribution of a group of 10 thousand persons was found to be normal with mean Rs.750 and standard deviation Rs.50. What percentage of this group has income i) exceeding Rs.668 ii) less than Rs. 832 iii) between Rs.700 to Rs 800
- (*Given Area under curve for S.N.V. from $Z = 0$ to $Z = 1.64$ is 0.4495, and from $Z = 0$ to $Z = 1$ is 0.3413*)
10. Define Binomial distribution. State its mean and variance. If a random variable X has Binomial distribution with parameters $n = 4$ and $p = 2/3$ then find:
- i) $P(X = 0)$ ii) $P(X \leq 1)$ and iii) mean and variance of X.

Time Series

11. Define time series. Explain cyclical variations in time series. Compute 5-yearly moving averages from the following data:

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Value	14	16	18	20	16	15	17	22	25	27

Plot the original and trend values on the same graph.

12. What do you mean by trend in time series? State the methods of measuring trends. Find out the trend in the following time series by assuming 3-yearly cycle:

Year:	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Values:	20	24	22	25	28	30	33	30	36	37

Plot the original and trend values on the same graph.

13. Define time series. Explain seasonal variations in time series. Compute 4-yearly centered moving averages from the following data:

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Value	15	18	15	21	24	21	24	27	21	24

Plot the original and trend values on the same graph.

14. What is Least Square method of fitting a trend line? Fit a trend line by the Least Squares Method to the following data:

Year:	2005	2006	2007	2008	2009	2010	2011	2012
Wages:	14	16	18	20	22	24	26	28

15. Explain the method of Moving Averages? Compute 3-yearly moving averages from the following data:

Year:	2011	2012	2013	2014	2015	2016	2017	2018
Values:	10	12	11	14	9	10	13	11

Index Numbers

16. State problems involved in the construction of index numbers. Compute Fisher's price index number from the following data:

Commodity	2014		2016	
	Price (in Rs.)	Quantity (in Kg.)	Price (in Rs.)	Quantity (in Kg.)
A	15	5	20	7
B	10	9	18	8
C	22	4	24	6

17. Define index numbers. State the formula for i) Paasche's price index number ii) Laspeyre's Price index number iii) Fisher's price index number

Compute Fisher's price index number from the following data:

Commodity	2013		2014	
	Quantity	Expenditure	Quantity	Expenditure
A	10	150	15	300
B	13	169	18	270
C	9	135	14	280

18. Define weighted index numbers. Calculate price index number by the i) Laspeyre's method ii) Paasche's method and iii) Fisher's ideal method from the following data:

Commodity	2014		2017	
	Price (in Rs.)	Expenditure (in Rs.)	Price (in Rs.)	Expenditure (in Rs.)
A	5	75	7	84
B	3	36	6	90
C	6	42	8	80
D	4	56	7	105

19. Define index numbers and state its uses. Calculate price index numbers from the following data by applying i) Laspeyre's method ii) Paasche's method and iii) Fisher's method:

Commodity	2000		2001	
	Price	Value	Price	Value
A	2	16	4	20
B	5	60	6	60
C	4	60	5	60
D	2	36	4	80

Also, compute value index number.

20. State the relation between Laspeyre's, Paasche's and Fisher's price index numbers. The prices and quantities of commodities for 2009 and 2010 are given below:

Commodity	2009		2010	
	Price	Quantity	Price	Quantity
A	20	8	40	6
B	50	10	60	5
C	40	15	50	15
D	20	20	20	25

Compute Laspeyre's, Paasche's and Fisher's price index numbers.

Statistical Quality Control

21. State the advantages of S. Q. C. Construct control chart for mean and Comment on the state of the process.

Sample No.	1	2	3	4	5	6	7	8	9	10
Mean	12	11.5	11	8.9	8.8	10.5	11	11.5	10	11
Range	4	3	2	1	2	4	3	4	3	2

(Given $A_2=0.58$ for $n = 5$)

1. Explain the need of Statistical Quality Control techniques. State the control limits for Mean and Range charts. A sample of five items is taken every two hours from a factory and following data are obtained:

Sample No.	1	2	3	4	5	6	7	8	9	10
Mean	23	35	31	41	29	38	46	19	15	40
Range	2	9	4	2	7	3	5	6	8	5

Construct control chart for mean and examine whether the process is under control or not.
(Given $A_2=0.58$ for $n = 5$)

2. What is S. Q. C.? State control limits of the R-chart. Construct control chart for mean and examine whether the process is under control or not.

Sample No.	1	2	3	4	5	6	7	8	9	10
Mean	11.7	11.1	11.0	11.8	12.0	11.9	11.2	12.0	11.5	11.8
Range	4	2	1	5	4	3	2	1	1	4

(Given $A_2=0.58$ for $n = 5$)

3. Explain the construction of np-chart. Construct the np-chart from the following data:

Sample No. (each of 100 items)	1	2	3	4	5	6	7	8	9	10
No. of defectives	12	10	6	8	9	9	7	11	11	9

4. Explain the construction of c-chart.

The numbers of defects observed in the 15 samples are given below:

7, 12, 3, 20, 21, 5, 4, 3, 10, 8, 0, 9, 6, 7, 20

Construct c-chart and state your conclusion.