

2018

COMMERCE

Paper : CC-103

(Statistics for Business Decisions)

Full Marks : 40

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Module - I

Answer *any two* questions

1. (a) If $P(A) = \frac{1}{4}$, $P(B) = \frac{2}{5}$ and $P(A \cap B) = \frac{1}{7}$. Then find (i) $P(A \cup B)$ (ii) $P(A \cap B^c)$ and (iii) $P(A^c / B)$.
- (b) The probability of X, Y and Z becoming managers are $\frac{4}{9}$, $\frac{2}{9}$ and $\frac{1}{3}$ respectively. The probability that a new financial product will be introduced if X, Y and Z becoming managers are $\frac{3}{10}$, $\frac{1}{4}$ and $\frac{4}{5}$ respectively.
- (i) What is the probability that a new product will be introduced?
- (ii) What is the probability that the manager appointed was Z given that the new product has been introduced?
- (c) "Most of the methods of statistical inference have been developed on the assumption of normal distribution". Do you agree with the statement? Justify your answer. 3+4+3
2. (a) The life (hrs.) of an electronic device is a random variable with the following exponential distribution. $f(x) = \frac{1}{50} e^{-\frac{x}{50}}$, $x \geq 0$.
- (i) Find expected life of the device,
- (ii) What is the probability that the device will fail within 100 hours of its operation?
- (b) The probability of a salesman achieving his sales quota is 0.4. Find the probability that in a sample of 8 salesman
- (i) at least two
- (ii) at most three and
- (iii) exactly five salesman will achieve their respective sales quota.

Please Turn Over

- (c) At a petrol pump, the average quantity of petrol sold to a vehicle is 15 liters per day with a s.d. of 5 litres. If on a particular day, 200 vehicles took 25 or more litres of petrol from the pump, estimate the total number of vehicles who took petrol from the pump on that day. 3+3+4
3. (a) Define p.m.f. and p.d.f. verify whether the following are true probability distribution or not.
- (i) $f(x) = \frac{x-3}{6}$ for $x = 4, 5, 6$.
- (ii) $f(x) = \frac{x^2}{30}$ for $0 < x < 5$.
- (b) Explain the process of systematic sampling and stratified sampling.
- (c) State the expectation and standard error of sample mean for both SRSWR and SRSWOR. Of the two sampling techniques which one generally preferred and why? 3+4+3
4. (a) Draw a random sample of size 10 without replacement from the following data on daily sales ('00 ₹) of 24 shops in Kolkata, stating clearly the procedure followed by you.

235 228 227 233 247 258
 224 232 250 226 238 236
 236 235 246 241 243 232
 245 246 227 236 241 230

You may use following random numbers.

3967 8941 7989 3335 7577
 3942 8409 7053 5364 5872

- (b) If (X, Y) be a pair of discrete random variable with the joint distribution as follows :
- (i) Compute $P(X < Y)$, $P(2X + Y > 10)$ and $P(Y = 5 | X = 2)$.
- (ii) Compute correlation between X and Y .

Y \ X	1	3	5
2	6/30	4/30	2/30
4	1/30	3/30	3/30
6	3/30	4/30	4/30

3+(3+4)

Module-II

Answer *any two* questions

5. (a) Khana Khajana is a leading chain of restaurants operating in Mumbai. As an expansion plan, it now intends to open chain of restaurants in different locations of North, Central and South Kolkata. In order to take decisions regarding customer preferences of 3 different cuisines, it appointed a marketing research agency which collected a 309 random poll of lunch customers. The collected sample based on the age of the customers and preferred cuisines are shown below :

Preferred Cuisines

Age of Customers	Italian	Chinese	Continental	Total
	14-34	26	95	18
35-55	41	40	20	101
Above 55	24	13	32	69
Total	91	148	70	309

On behalf of the marketing research agency, you are required to test at 1% level of significance whether the two attribute variables are independent or not?

- (b) Veeruksha Software Technology Ltd., a supplier of computer operating system software, was planning the initial public offerings (IPO) of its stock in order to raise sufficient working capital finance for its urgent need emerging out of radical technological growth. With the current earnings of ₹ 1.61 a share, the company and its underwriters were contemplating an offer price of ₹ 21, or about 13 times earnings. In order to check the appropriateness of this price, they randomly selected 7 publicly traded software companies and found that their average price/earnings (P/E) ratio was 11.60 and the sample standard deviation was 1.3. At a 1% level of significance, can the company conclude that the stocks of publicly traded software companies have an average P/E ratio which is significantly different from 13?
- (c) State mathematical model, null hypothesis and assumptions for one-way ANOVA model. Give some applications in business decision. 4+3+3
6. (a) An experiment was conducted in a research laboratory to study the performance of three washing powder brands using four water temperatures and the following whiteness readings were obtained with specially designed equipment :

Water Temperature	Washing Powder Brand		
	Sunbright	Lemon Excel	Wave Plus
Hot Water	57	55	67
Warm Water	49	52	68
Normal Water	54	46	58
Cold Water	36	25	59

You are required to perform a two-way ANOVA at a 5% level of significance to determine whether there is any significant difference between detergents or between the water temperatures.

Please Turn Over

- (b) In a test of two television commercials, each commercial was shown in a separate test area 6 times over a 1-week period. The following week a telephone survey was conducted to identify individuals who had seen the commercials. The individuals who had seen the commercials were asked to state the primary message in the commercials. The following results were recorded :

Commercial	Number who saw Commercial	Number who recalled the Primary message
A	150	63
B	200	60

Obtain 95% confidence interval for the difference between the recall proportions for the two populations.

- (c) Number of automobile accidents per month in a certain area were as follows :

72, 80, 92, 83, 84, 70, 75, 68, 79, 74, 85, 78.

Are these frequencies in agreement with the belief that accident conditions were same during this 12 month period? 5+2+3

7. (a) Briefly describe different methods of forecasting used in business decisions.
 (b) The following are the price movement of 3 stocks over a period of time.

Stock A (X_1)	Stock B (X_2)	Stock C (X_3)
28	30	27
30	37	21
14	18	14
27	29	21
15	24	18
22	31	14

- (i) Estimate the value of X_1 when $X_2 = 35$ and $X_3 = 30$.
 (ii) Compute multiple correlation $R_{1.23}$ partial correlations $r_{12.3}$, $r_{13.2}$ and interpret the result. 3+(4+3)

8. (a) What are the major steps of forecasting by decomposition of time series components?
 (b) Using the method of single exponential smoothing, find predicted sales for 2019. Take smoothing coefficient $\alpha = 0.1$.

Year :	2010	2011	2012	2013	2014	2015	2016	2017	2018
Sales :	200	185	195	197	210	175	155	180	220

(5)

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- (c) As part of an investigation of employee turnover, an industry wide survey of people in sales management positions gave the number of years of experience is Sales— related positions. These data are summarized in the following table :

	Males	Females
Sample size :	80	70
Mean years :	21.7	18.5
Std. dev. of years :	9.3	4.8

Construct a 95% confidence interval for the difference of mean.

2+4+4

You may use the following table values :

$\Phi(1) = 0.8413$	$e = 2.7182$
$\Phi(2) = 0.9772$	$t_{0.01,6} = 3.143$
$Z_{0.05} = 1.645$	$t_{0.01,7} = 2.998$
$Z_{0.025} = 1.960$	$t_{0.01,11} = 2.718$
$Z_{0.01} = 2.326$	$t_{0.01,12} = 2.681$
$Z_{0.005} = 2.576$	
$\chi^2_{0.01,4} = 13.277$	$F_{0.05,3,6} = 4.76$
$\chi^2_{0.01,6} = 16.812$	$F_{0.05,2,6} = 5.14$
$\chi^2_{0.05,11} = 19.675$	$F_{0.05,3,8} = 4.07$
$\chi^2_{0.05,12} = 21.026$	$F_{0.05,2,9} = 4.26$
