

2021**TWO YEAR M. COM. SEMESTER 1 EXAMINATION***(New Syllabus under CBCS)***Instructions for Examinees from Affiliated Colleges***The students are required to strictly adhere to the following instructions:*

1. Use A4 size paper for giving the examination.
2. Write the following on the top of the first page of answer sheet:
 - i) Roll Number: **(as per the Admit Card)**
 - ii) Registration Number: **(as per the Admit Card)**
 - iii) Paper Code and Name of the Paper
 - iv) Date of the Examination
 - v) Duration of Examination **(12 Noon to 2 P.M.)**
3. Put page number on the top right of each page (including the first page).
4. Only one side of the paper should be used for examination.
5. Put your **full signature with date**, at the bottom right of every page used.
6. Before sending your answer scripts, arrange the pages sequentially. Scan them in the order of page number and convert them into a single pdf. file.
7. **PDF file name** should be your **Full Roll Number <underscore> paper code**. While submitting the answer scripts, the subject of the mail will be exactly the same with the file name. [e.g., if the roll no of a student is **017/MCM/123456** for third paper **(Paper Code CC103)** the file name will be:**017-MCM-123456_CC103**.
8. Submit your answer scripts in **PDF Format** within the stipulated time through **designated email id** given to you.
9. Preserve your answer scripts in soft as well as hard-copy form of all the papers of your examination

2021**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.***Time: 2 Hour****Duration of Examination: 12noon to 2pm****Module – I**Answer *any two* questions.

1. (a) An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of accidents is 0.01, 0.03 and 0.05 respectively. An insured person meets an accident. What is the probability he is a scooter driver?

(b) Let X denotes the number of times a photocopy machine will malfunction: 0, 1, 2, or 3 times on any given month. Let Y denote the number of times a technician is called on an emergency call. The joint probability mass function $p(x, y)$ is presented in the table below

$x \backslash y$	0	1	2	3
0	0.15	0.30	0.05	0
1	0.05	0.15	0.05	0.05
2	0	0.05	0.10	0.05

- (i) Find the probability $P(X > Y)$.
- (ii) Find $p(x)$ and $p(y)$, the marginal p.m.f. of X and Y respectively.
- (iii) Are X and Y independent? If not, use suitable statistical measure to find the relationship between X and Y. [4 + (1 + 1 + 4)]

2. (a) A period of 300 days was observed for the number of accidents taking place per day in a big city. The distribution of number of accidents per day is given below. Assuming Poisson distribution find expected frequencies and comment.

No. of accidents :	0	1	2	3	4	5	6	7
No. of days :	120	69	42	30	21	12	5	1

(b) Construct the sampling distribution of sample means for simple random samples without replacement of two families from a population of 5 families as given below:

Family :	A	B	C	D	E
Family size :	4	3	2	5	7

Also compute mean and standard error of sample mean. [4 + 6]

3. (a) An unbiased coin is tossed four times. Let X denotes the number of heads, compute mean and variance of X.

(b) On the basis of a random sample of size 10 derive the maximum likelihood estimator of the parameter of a binomial distribution.

(c) Briefly describe different criteria of a good estimator. [3 + 3 + 4]

4. (a) Derive the formula for standard error of sample mean in SRSWOR from a finite population.

(b) How are the Chi-square distribution, t-distribution and F-distribution constructed from normal observations with mean μ and variance σ^2 ?

(c) At a petrol pump, the average quantity of petrol sold to a vehicle is 15 litres per day with a s.d. of 5 litres. If on a particular day, 190 vehicles took 20 or more litres of petrol from the pump, estimate the total number of vehicles took petrol from the pump on that day.

[3 + 3 + 4]

Module - II

Answer *any two* questions.

5. (a) Nine medicine dealers of a state were asked by the State Govt. for their prices per unit (in Rupees) on two similar inhaler brands having generic composition Formoterol Furmarate and Budesonide. This information is very urgent for upsurge of fast spreading SARS- CoV-2, as the number of coronavirus patients in state run hospitals have increased significantly. The result of the survey is furnished below:

Dealer	1	2	3	4	5	6	7	8	9
Foranort 200	250	319	285	260	305	295	289	309	275
Bodecort FB 200	270	325	269	275	289	285	295	325	300

At 5% level of significance, is it reasonable to assert that, on average, Foranort 200 is less expensive than Bodecort FB 200?

(b) The following zero order correlation coefficients are given:

$$r_{12} = 0.8, r_{13} = 0.5 \text{ and } r_{23} = 0.6$$

Compute the value of coefficient of multiple determination treating the first variable as Dependent Variable and second and third variables as Independent Variables. Compute the partial correlation between first and third variable eliminating the effect of second variable. Also interpret the results. [6 + 4]

6.(a) Bahubaali Ltd., an MNC, is having more than 500 employees under its pay roll working in India. The management of the company has introduced an intensive and comprehensive management-training program for its employees working at different management levels and having different experiences. In order to evaluate the effectiveness of different sessions of training program and difference in aptitude among employees of different experience categories, the management of the company has chosen randomly 15 employees and takes managerial skill aptitude test. The scores of the employees are tabulated as under:

Experience Category (Years)	Training Program				
	Session 1	Session 2	Session 3	Session 4	Session 5
0-5	30	24	33	36	27
5-10	26	29	24	31	35
More than 10	38	28	35	30	35

At a 5% level of significance, determine the following:

(i) Are the five sessions of comprehensive training program equally effective in enhancing the managerial skill of the employees?

(ii) Is there any significant aptitude difference among employees of different experience categories?

(b) Using the method of exponential smoothing find forecasted sales on 9th day. Take the initial forecast as 150 and smoothing coefficient (α) = 0.2

Day	1	2	3	4	5	6	7	8
Sales ('000 units)	160	180	132	173	145	201	165	177

[6 + 4]

7. (a) In order to plan its operation and capital needs better, the management of a company wants to estimate overhead costs. For this purpose, they collected the following data on labour hours (x_2), machine hours (x_3) and overhead cost (x_1) for last 10 years.

Year	x_2 ('00 hours)	x_3 ('00 hours)	x_1 (in lakhs)
2011	38	10	12.1
2022	40	12	13.3
2013	40	13	14.5
2014	41	14	16.5
2015	40	14	16.4
2016	42	15	18.6
2017	45	15	24.2
2018	47	14	26.9
2019	49	16	35.1
2020	51	17	38.5

Using regression analysis, estimate the annual overhead costs for 4600 labour hours and 1800 machine hours.

b) On 26th November, 2021 Friday, the prices of 11 shares in a random sample of 40 of the roughly 5,500 of that type of shares traded on the National Stock Exchange (NSE) increased. On 25th November, 2021 Thursday, prices of 24 shares increased out of a random sample of 60 shares traded in NSE. Can you conclude at 1% level of significance that price of a smaller proportion of NSE shares increased on Friday than did on Thursday? Obtain 99% confidence interval for difference of proportions. [6 +4]

8. (a) What are the major steps of forecasting by decomposition of time series components? Forecast sales for four quarters of 2022 by using decomposition method from the following data assuming the linear trend:

Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
2018	79	85	91	97
2019	103	109	115	121
2020	127	133	139	145
2021	151	157	163	169

b) A quality control supervisor for an automobile manufacturer is concerned with uniformity in the number of defects in cars coming off the assembly line. If one assembly line has significantly more variability in the number of defects, then charges have to be made. The supervisor has collected the following data:

	Number of defects	
	Assembly Line A	Assembly Line B
Mean	10	11
Variance	9	25
Sample Size	10	8

Does the assembly line B has significantly more variability in the number of defects than A?

Test at 5% level of significance.

[6 + 4]

Table Values: -

[Given that, $\Phi(1.5) = 0.9331$, $\Phi(1.0) = 0.8413$, $\Phi(2.0) = 0.9772$, $Z_{0.025} = 1.960$, $Z_{0.05} = 1.645$,
 $Z_{0.01} = 2.326$, $Z_{0.005} = 2.576$, $\chi^2_{0.05, 3} = 7.815$, $\chi^2_{0.05, 4} = 9.488$, $t_{0.01, 23} = 2.500$, $t_{0.01, 25} = 2.485$,
 $t_{0.005, 19} = 2.861$, $t_{0.05, 8} = 1.860$, $t_{0.05, 9} = 1.833$, $t_{0.005, 20} = 2.845$, $F_{0.05, 3, 6} = 4.757$,
 $F_{0.05, 2, 6} = 5.143$, $F_{0.05, 2, 8} = 4.459$, $F_{0.05, 4, 8} = 3.838$, $F_{0.05, 9, 7} = 3.680$, $F_{0.05, 10, 8} = 3.350$,
 $e = 2.7183$]