Exam.Code:0013
Sub. Code: 0820

2021

Bachelor of Commerce

Third Semester

BCM-304: Business Mathematics and Statistics

Time allowed: 3 Hours

Max. Marks: 80

***NOTE**: Attempt <u>four</u> short answer type questions from Section–A. Attempt <u>two</u> questions each from Section B and C respectively.*

x-x-x

Section – A

1. If $A = \begin{bmatrix} 5 & 2 \\ -1 & 2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then show that $(A - 3I)(A - 4I) = O$.

2. Without expanding the determinant, show that $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}+1$ is a factor of

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}.$$

3. Find $\frac{dy}{dx}$ if $e^{x-y} = \log\left(\frac{x}{y}\right)$.

4. Explain the relative merits and demerits of arithmetic mean, median and mode as measures of central tendency.

5. Find the standard deviation for the following data :

X :	3	8	13	18	23
f :	7	10	15	10	6

6. Explain the mathematical properties of arithmetic mean. What is the relationship between mean, median and mode ?

(4x5)

Section – B

7. For the matrix $A = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 0 & -2 \\ 1 & 0 & 3 \end{bmatrix}$, find adjA and verify that

$$A\,(\text{adj } A) = (\text{adj } A)\,A = |A|\,I.$$

8. Prove that $\begin{vmatrix} (b+c)^2 & ba & ca \\ ab & (c+a)^2 & cb \\ ac & bc & (a+b)^2 \end{vmatrix} = 2abc\,(a+b+c)^3$.

9. (*a*) If $y^x = e^{y-x}$, prove that $\frac{dy}{dx} = \frac{(1+\log y)^2}{\log y}$.

(*b*) Find $\frac{dy}{dx}$, when $y = a^{t+\frac{1}{t}}$, $x = \left(t+\frac{1}{t}\right)^a$, $a > 0$.

10. Find the maximum and minimum values of the following functions :

(*i*) $f(x) = \frac{x^4}{x-1}$, $x \neq 1$ (*ii*) $f(x) = (1-x^2)\,e^x$.

(2x15)

P.T.O.

Section –C

11. The first and the third quartiles of the following data are given to be 12.5 marks and 25 marks respectively :

Marks :	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35	35 – 40	Total
Frequency :	4	8	?	19	?	10	5	?	72

Find the missing frequencies ?

12. From the data given below state which group is more variable, A or B ?

Marks	10–20	20–30	30–40	40–50	50–60	60–70	70–80
Group A :	9	17	32	33	40	10	9
Group B :	10	20	30	25	43	15	7

13. Explain the different components into which a time series may be analyzed. Explain the least square method of fitting trend in a time series.

14. Compute index number for 2009 taking 2008 as base by using geometric mean, arithmetic mean and median from the data given below :

Commodities	**Price 2008 (in ₹)**	**Price 2009 (in ₹)**
A	40	44
B	30	50
C	36	32
D	50	52
E	32	40
F	84	90

(2x15)

x-x-x