

(b) (i) Show that $A = \begin{pmatrix} 1 & -3 & -4 \\ -1 & 3 & 4 \\ 1 & -3 & -4 \end{pmatrix}$ then prove that $A^2 = 0$

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(ii) In how many ways 3 boys and 5 girls can be arranged in a row so that all the 3 boys are together?

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(iii) Given $A = \{1,2,3,4,5\}$ and $B \cup C = \{3, 4, 6\}$; find $(A \cap B) \cup (A \cap C)$ and $(A-B) \cap (A-C)$.

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B.Com. 1st Semester (Honours) Examination-2022-23

COMMERCE

Course ID : 11212

Course Code : BCOMH-102C-2

Course Title : Business Mathematics

Time : 2 Hours

Full Marks : 40

The figures in the right hand margin indicate full marks.

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

1. Answer any five of the following questions : 2×5=10

(a) If $A = \{5,6,7\}$, $B = \{3,6,7,8\}$ find $(A \cap B)$

(b) The sum of p th term of an A.P. is $4p^2 + 3p$. Find the 12 term of this A.P.

(c) If ${}^{(n+r)}P_2 = 110$. ${}^{(n-r)}P_2 = 20$ find n and r

(d) Prove without expanding $\begin{vmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{vmatrix} = 0$.

(e) Express $A = \begin{vmatrix} 1 & 3 & 4 \\ 7 & 2 & 6 \\ 2 & 8 & 1 \end{vmatrix}$ as $P + Q$ where P is a symmetric

matrix and Q is a skew symmetric matrix.

(f) Discuss the continuity of $f(x)$ at $x = 4$

where $f(x) = 2x+1, x \neq 4$

$= 8, x = 4$

(g) If $u = xyz$, show that $x \frac{\partial u}{\partial x} = y \frac{\partial u}{\partial y} = z \frac{\partial u}{\partial z}$

(h) Evaluate $\int_1^2 (\log x + 1) dx$

2. Answer any *four* of the following questions : $5 \times 4 = 20$

(a) (i) Find the sum of the series : $1 + 3 + 6 + 10 + 15 + \dots$ to n terms.

(ii) Show that $\log 1 + \log 2 + \log 3 = \log 6$.

(b) (i) Evaluate $\lim_{x \rightarrow a} \frac{\sqrt{x} - \sqrt{a}}{x - a}$

(ii) The sum of first 8 terms of a G.P. is five times the sum of the first 4 terms. Find the common ratio.

(c) Prove that $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3$

(d) (i) If $f(x) = \begin{cases} kx+5, & x \leq 2 \\ x-1, & x > 2 \end{cases}$ is continuous at $x = 2$ then

find the value of K .

(ii) Evaluate : $\int (x^5 + 5^x) dx$

(e) (i) Find $\frac{dy}{dx}$ when $y = e^{\frac{y}{x}}$

(ii) Find $\frac{dy}{dx}$ of the function $y = e^x \cdot \log x$.

(f) Solve the system of equations by Cramer's rule :

$$x + 3y = 4, y + 3z = 7, z + 4y = 6$$

3. Answer any *one* of the following questions : $10 \times 1 = 10$

(a) (i) Find the inverse of the matrix $\begin{pmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{pmatrix}$. 5

(ii) Show that $f(x,y) = \frac{x^4 + y^4}{x-y}$ is a homogeneous function of degree 3. 2

(iii) Find the minimum value of $\frac{x}{\log x}$ 3