

December- 2022

Pre University Test

B.C.A(General) -I SEMESTER

Mathematics (BSC17-103)

Time: 3:00 Hrs.

[Max Marks : 75]

Instructions:

1. It is Compulsory to answer all the questions (1.5 mark each) of Part -A in short
2. Answer any four questions from **Part - B** in detail.
3. Different **Sub-parts** of a question are to be attempted adjacent to each other.

Part - A

- 1 (a) If $A = \{a, b, c, d, e\}$ and $B = \{d, e, f, g\}$, then find $(A - B) \cap (B - A)$.

[CO-1] (1.5)

- (b) Define Scalar matrix with example .

[CO-1] (1.5)

- (c) Find the value of $\begin{bmatrix} \sin 30^\circ & \cos 30^\circ \\ -\sin 60^\circ & \cos 60^\circ \end{bmatrix}$

[CO-4] (1.5)

- (d) Let R be relation in the set $\{1, 2, 3, 4\}$ given by

$$R = \{ (1,2), (2,2), (1,1), (4,4), (1,3), (3,3), (3,2) \}. \text{ Prove that } R \text{ is reflexive}$$

And transitive but not Symmetric.

[CO-3] (1.5)

- (e) Prove that greatest integer function $f: \mathbb{R} \rightarrow \mathbb{R}$ given by $f(x) = [x]$ is

neither one -one nor onto .

[CO-2] (1.5)

- (f) Find the value of $\log_{x-2} \frac{x^4 - 2^4}{(x-2)}$.

[CO-3] (1.5)

- (g) Differentiate $\frac{x^2}{(1+x^2)}$ with respect to x

[CO-2] (1.5)

- (h) $\int_0^{\frac{\pi}{2}} \sin^2 x \, dx$.

[CO-4] (1.5)

(i) Prove that $\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx$. [CO-1] (1.5)

(j) Differentiate w.r.t x the given function $e^{\frac{x^2}{(1+x^2)}}$ [CO-4] (1.5)

Part- B

1. (a) Show that $\begin{bmatrix} a^2 & 2ab & b^2 \\ b^2 & a^2 & 2ab \\ 2ab & b^2 & a^2 \end{bmatrix} = (a^3 + b^3)^2$ [CO-2] (8)

(b) Solve the system $\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 4$, $\frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 1$, $\frac{6}{x} + \frac{9}{y} - \frac{20}{z} = 2$.

[CO-2] (7)

2. (a) If $f: R \rightarrow R$ is defined as $f(x) = \frac{5x+3}{7}$, $x \in R$. Prove that f is bijective function and hence find the inverse of f . [CO-4] (8)

(b) Find all points of discontinuity of

$$f(x) = \begin{cases} x+2 & \text{if } x < 1 \\ 0 & \text{if } x = 1 \\ x-2 & \text{if } x > 1 \end{cases}$$
 [CO-2] (7)

3. (a) Find $\frac{dy}{dx}$ if $x = \frac{\sin^3 t}{\sqrt{\cos 2t}}$, $y = \frac{\cos^3 t}{\sqrt{\cos 2t}}$. [CO-3] (8)

(b) Differentiate the function $f(x) = e^x \cos^3 x \sin^2 x$. [CO-4] (7)

4. (a) Evaluate the given integral as limit of Sum $\int_0^2 x + 5$. [CO-2] (8)

(b) Evaluate the following $\int_0^1 \frac{x}{3+4x+x^2} dx$. [CO-3] (7)

5. (a) Evaluate the given integral as limit of Sum $\int_0^2 x + 5$. [CO-2] (5)

(b) Evaluate the following $\int_0^1 \frac{x}{3+4x+x^2} dx$. [CO-3] (5)

6.(a) Prove that $\frac{dy}{dx} = \frac{\log x}{(1+\log)^2}$ if $x^y = e^{x-y}$. [CO-3] (7)

(b) Evaluate the given definite integral [CO-4] (8)

$$\int_1^2 \frac{dx}{\sqrt{x^2+2x+3}}$$

7. (a) For any set A,B Prove the De Morgan's Law [CO-3] (7)

(i) $(A \cup B)' = A' \cap B'$

(ii) $(A \cap B)' = A' \cup B'$ [CO-2] (8)