Roll No. ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚   **Total No. of Pages : 03**

Total No. of Questions : 07

B.Sc.(IT) (2015 & Onward) / BCA (2011 & Onwards)   (Sem.–2)

MATHEMATICS – II
Subject Code : BSIT/BSBC-202
Paper ID : [B1114]

Time : 3 Hrs.   **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains SIX questions carrying TEN marks each and students have to attempt any FOUR questions.**
3. **Log tables may be asked if needed.**

SECTION-A

1. **Write briefly :**

    a) If $A = \begin{bmatrix} b & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 16 & 0 \\ 5 & 1 \end{bmatrix}$, then find the value of 'b' such that $A^2 = B$.

    b) Construct a 3×4 matrix whose elements a_{ij} are given by $\dfrac{(i+2j)^2}{2}$.

    c) Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & -1 \\ 3 & -1 & 2 \\ 2 & 4 & -2 \end{bmatrix}$.

    d) If the mean of a set of observations $x_1, x_2, x_3, \ldots, x_{10}$ is 20, then find the mean value of $x_1 + 4, x_2 + 8, x_3 + 12, \ldots, x_{10} + 40$.

    e) Evaluate $\displaystyle\int \frac{x^2}{(x-1)\,(x-2)}\, dx$.

    f) Evaluate $\displaystyle\int x^2 e^{3x} dx$.

    g) Find the median of the data : $x = 10, 11, 12, 11, 12, 10, 12, 11$.

h) Differentiate $\sqrt{\tan\sqrt{1+x^3}}$ w.r.t. x.

i) State Simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rule to evaluate $\int\limits_{a}^{b} f(x)\ dx$.

j) Find value of $\log_2\sqrt{8}$.

SECTION-B

2. (a) Using properties of determinants, prove that

$$\begin{vmatrix} a & a+b & a+b+c \\ 2a & 3a+2b & 4a+3b+2c \\ 3a & 6a+3b & 10a+6b+3c \end{vmatrix} = a^3.$$

(b) Find the inverse of $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$.

3. (a) Use matrix method to solve the following system of equations

$x + y + z = 3$, $2x - y + z = 2$, $x - 2y + 3z = 2$.

(b) Without using log tables, prove that $7\log_2\left(\dfrac{16}{15}\right) + 5\log_2\left(\dfrac{25}{24}\right) + 3\log_2\left(\dfrac{81}{80}\right) = 1$

4. (a) At what rate of interest Compounded annually, a sum of money may become double of itself in 10 years.

(b) Differentiate *w.r.t.* x $\sqrt{\dfrac{1+\tan x}{1-\tan x}}$.

5. (a) Find two positive numbers whose sum is 14 and the sum of whose squares is minimum.

(b) Evaluate the following integrals :

(i) $\int_0^{\pi/4} \tan^2 x \, dx$

(ii) $\int \frac{1}{(x-1)(x+2)} dx$.

6. (a) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Trapezoidal rule and compare the result with its actual value.

(b) Differentiate the following functions *w.r.t. x*.

(i) $\log_2 x + \log_x 2 + \log_x x + \log_2 2$

(ii) $\frac{e^x + \tan x}{1 + \sin x}$.

7. (a) An incomplete frequency distribution is given as under :

Variable	10–20	20–30	30–40	40–50	50–60	60–70	70–80
Frequency	12	30	?	65	?	25	18

Given that the median value is 46 and the sum of the frequencies is 229. Find the missing frequencies.

(b) Calculate the S.D. of the following distribution :

Class	0–7	7–14	14–21	21–28	28–35	35–42	42–49
Frequency	19	25	36	72	51	43	28