2017

BUSINESS MATHEMATICS

Full Marks: 80

Time: 3 hours

(The figures in the margin indicate full marks for the questions)

1. Answer the following questions: 1x10=10

1) Is $\{x : x+5=5\}$ is null set?

2) Evaluate:

$$\log_{3\sqrt{3}}^{27}$$

3) Is a scalar matrix, a diagonal matrix? (Yes/No).

4) Fill in the blank:

$${}^{13}C_8 + {}^{13}C_9 = \_\_\_\_$$

5) If any two rows (or columns) of a determinant are identical, what will be the value of the determinant?

6) $\frac{d}{dx}\left(\sqrt{x^2+3}\right)$

$$\int_1^2 \frac{1}{x}dx$$

7) Evaluate:

8) Find the slope of the line which passes through the points $(5,-2)$ and $(3,-1)$.

9) If interest is compounded half yearly, what is the formula for finding amount?

A = Amount, r = Rate

P = Principal, n = No. of years

10) Give the definition of 'decision variable' associated with linear programming.

2. (1) Is - 116 a term of the A.P. series 46, 38, 30, ... 2x5=10

(2) If $A=\begin{bmatrix}5 & -2\\ 0 & 7\end{bmatrix}$, $B=\begin{bmatrix}2 & -3\\ -1 & 4\end{bmatrix}$ find BA.

(3) Write two differences between a matrix and a determinant.

(4) For what value of m, the line $mx-5y-11=0$ passes through the point $(-7,9)$? Find.

(5) Prove that:

$$\frac{1}{\log a^{(abc)}}+\frac{1}{\log b^{(abc)}}+\frac{1}{\log c^{(abc)}}=1$$

3. Answer the following questions: 5x4=20

(a) If a,b,c be the pth, qth and rth term respectively of a G.P., prove that $a^{q-r}b^{r-p}c^{p-q}=1$

Or

A man took a loan of Rs. 7,200 to be repaid in 20 installments, where the installments from an A. P. After 15 installments one-third of the loan remains unpaid. Find the value of 16th installment.

(b) A machine costs Rs. 4,00,000. Its value depreciates at the rate of 10% p.a. What will be its value after 4 years?

Or

In how many years will an annuity of Rs. 400 amount to Rs. 4,064 if interest is 3% compound annually?

Given : $\log 1.3048 = 0.1155$

$\log 1.03 = 0.0128$

(c) Show that:

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

Or

If

$U=\{1,2,3,4,5,6,7,8\}$
$A=\{1,2,3,4\}$
$B=\{2,3,5,7\}$
$C=\{2,4,6,8\}$

Find (1) $A \cap (B-C)$

(2) $A^c \cup (B-C)^c$

(d) Prove that: ${}^{2n}P_n = 2^n\{1.3.5.....(2n-1)\}$

Or

A question paper consists of two groups A and B. Each group consists of 5 questions. In how many ways a student can answer 6 questions in all if he has to answer at least two questions from each group?

4. (a) Solve by Cramer's rule. 7

$3x+y+2z=3$
$2x-3y-z=-3$
$x+2y+z=4$

Or

Find the inverse of the matrix:

$$A=\begin{bmatrix} 1 & 0 & 2 \\ 2 & -1 & 3 \\ 4 & 1 & 8 \end{bmatrix}$$

(b) If $a^2+b^2=14ab$, prove that 3

$$\log\left\{\frac{1}{\sqrt{3}}(a-b)\right\} = \frac{1}{2}(2\log 2+\log a+\log b)$$

Or

Prove that:

$$X^{\log y-\log z} \times Y^{\log z-\log x} \times Z^{\log x-\log y} = 1$$

5. (a) Establish the equation of a line in the form $y=mx+c$. 5

(b) Find the equation of the line passing through the point of intersection of the lines $2x-3y-9=0$ and $5y-3x+14=0$ perpendicular to the line $6x-7y+11=0$. 5

Or

A firm finds that its customers will buy 15% more of its product if the price of the product is reduced by Rs. 5. When the price is Rs. 25, the firm is selling 1,000 units. Assuming the demand curve to be linear, find its equation.

$\phi(x)=\frac{1}{x^2}$

6. (a) (1) If , prove that 3

$$\phi(x+b)-\phi(x)=-\frac{b(2x+b)}{\{x(x+b)\}^2}$$

(2) Evaluate: 2

$$\lim_{x\to 0}\frac{x}{\sqrt{2+x}-\sqrt{2-x}}$$

Or

A function is defined as:

$$f(x)=\begin{cases}1-x, 0\le x\le 1\\ x-1, x>1\end{cases}$$

$f(x)$ $x=1$
Is continuous at ?

(b) Find: 2+2+1=5

1) The average revenue function (AR).
2) The marginal revenue function (MR).
3) Total revenue (TR).

$$=25Q-\frac{Q^2}{5}+3$$

Q = No. of output sold.
Evaluate AR and MR at Q = 4.

Or

A radio manufacturer finds that he can sell x radios per week at Rs. P each where $P=2\left(100-\frac{x}{4}\right)$ $\left(120x-\frac{x^2}{2}\right)$. His cost of production for x radios per week is Rs. . Show that his profit is maximum when the production is 40 units per week. Also find the maximum profit.

7. (a) Integrate any two of the following:
2x2=4

1) $\int(6x+1)\sqrt{3x^2+x}dx$

2) $\int\frac{4x-5}{4x^2-10x+8}dx$

3) $\int_a^b e^{mx}dx$

8. Solve the following LPP graphically. 6

Maximize $Z=50x+80y$
subject to the constraint s
$x+2y\le 160$
$5x+6y\le 600$
$x\le 80$
$y\le 60 x, y\ge 0$