5 YEARS SCANNER BBA-I BUSINESS MATHEMATICS

Unit-I- Calculus, Differentiation, Maxima -Minima, Integration

1. **(2016)**
   i. Differentiate $(\sqrt{x} + 1/\sqrt{x})^2$ w.r. to x.
   ii. Differentiate $(x^2 - 3x + 2)(x + 2)$ w.r.to x.
   iii. Differentiate $(x + 1)/(x^2 + 2x + 2)$ w.r.to x
   iv. Differentiate $(x^2 + x + 1)/\sqrt{x}$ w.r.to x.

2. **(2016)**
   i. If $u = \log\{(x^4 + y^4)/(x + y)\}$, then prove that $x\partial u/\partial y + y\partial u/\partial y = 3$
   ii. Find the maximum & minimum values of the function $x^3 - 2x^2 + x + 6$.

3. Integrate the following: **(2016)**
   i. $\int\{(ax^4 + bx^3 + c)/x^4\}.dx$
   ii. $\int\{(x^3 - 3x^2 - 2)/(x - 1)\}.dx$
   iii. $\int xe^x .dx$
   iv. $\int\{1/(x - 1)(x - 2)\}.dx$

4. **(2016)**
   i. If $u = x / y$, then find $\partial u/\partial x$ & $\partial u/\partial y$.
   ii. A firm can sell as many units that it can produce at Rs. 30 per unit. The total cost of producing x units is:
   $C = 25 + 2x + 0.01x^2$ (**Unit III**)
   Find the number of units that the firm should produce to obtain maximum profit.What is the maximum profit?

5. Find out the derivative dy/dx of the following implicit function: **(2015)**
   i. $x^2y + xy^2 = 25$
   ii. $$Y = x + \cfrac{1}{x + \cfrac{1}{x + \frac{1}{x} + \ldots\ldots \infty}}$$

6. **(2015)**
   a) A Company has examined its cost structure & revenue structure & has determined the Total Cost TC, Total Revenue TR & q the number of units produced are related as :
   $TC = 300 + 0.045q^2$ & $TR = 9q$
   Find the production rate q that will maximum profit of the company.
   Find that profit & also find profit when q = 150.7
   b) Find the maximum values of the function below:
   $F = x^4 + 2x^3 - 3x^2 - 4x + 4$

7. Differentiate the following functions with respect to X: **(2015)**
   i. $\{\sqrt{(a + x)} - \sqrt{(a - x)}\} / \{\sqrt{(a + x)} + \sqrt{(a - x)}\}$
   ii. $e^{\sqrt{\cot x}}$
   iii. $\tan\{\log\sqrt{(1 + x^2)}\}$
   iv. $\log\{(x + \sqrt{(x^2 + a^2)}) / a\}$

8. Integrate the following functions: **(2015)**
   i. $\int dx/(\sqrt{(xe^{\sqrt{x}}})$
   ii. $\int\{(2 + \sqrt{x})^2/2\sqrt{x}\}.dx$
   iii. $\int\{x^{n-1}/(2 + 3x^n)\}.dx$
   iv. $\int(1 - 1/x^2).e^{x + 1/x} . dx$

9. **(2015-S)**
   a) Find out the first order, second order cross partial derivatives for $Z = 3X^2Y^3$ & evaluate them when x = 4 & y =1.
   b) Find the maximum & minimum values of the function below:
   $F = x^4 + 2x^3 - 3x^2 - 4x + 4$

10. Integrate the following functions: **(2015-S)**
   i. $\int(2 + \sqrt{x})^2/\,^2\sqrt{x} . dx$
   ii. $\int(1 + 1/x^2) . e^{x + 1/x} .dx$
   iii. $\int(x^3 + 5)^2 . 3x^2 . dx$
   iv. $\int(x + 1) / \sqrt{(x^2 + 2x + 4)} . dx$

11. **(2015-S)**
a) Differentiate :
   $3\sqrt{(2x^2 - x + 1)}$ w.r.to x
b) Find dy/dx
   When $y = \{^x\sqrt{(x^2 - c^2)}\}/2 - (c^2/2)\log[\{x + \sqrt{(x^2 - c^2)}\}/2]$

12. Find the maxima & minima values of the following functions: **(2015-S)**
   i. $y = -7x^2 + 126x - 23$

ii. $y = 7x^2 + 12x - 54$
iii. $Y = -9x^2 + 72x - 13$
iv. $Y = x^3 - 6x^2 - 135x + 4$

13. Find out the differentiation w.r.to x(i.e. dy/dx) any four of the following : **(2012)**
   i. $\sqrt{(2x^2 + 3)}$
   ii. $\cos x^3$
   iii. $(1-x)/(1+x)$
   iv. $4x^3 - \tan x + e^x - 4$
   v. $\log(x^2 + 1)$
   vi. $_e e^x$

14. **(2012)**
   a) If $x^3y + 3x^2y^2 - y^3$, find dy/dx
   b) If $f(x.y) = x^2y^2 + x_3y - x^3y^2 + 3x - 1$, find $\partial^2 f / \partial x \partial y$.

15. **(2012)**
   a) If $u = \sin^{-1}(\{x^2 + y^2\}/\{x + y\})$; then prove that : $x\partial u/\partial x + y\partial u/\partial y = \tan u$.
   b) Find the maximum value of : $(x - 1)(x - 2)(x - 3)$

16. Integrate any four of the following: **(2012)**
   i. $\int(x^3 + e^x - \sin x)\,.dx$
   ii. $\int\{e^x / (1 + e^x)\}.dx$
   iii. $\int \sin^2 x\,.\cos x\,.dx$
   iv. $\int(x^2 + 1/x^2)^2.dx$
   v. $\int 1 / \{(x + 1)(x - 1)(x - 2)\}.dx$
   vi. $\int(1 + x)^3 / \sqrt{x}\,.\,dx$

Unit-II- Matrices & Determinants,

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1. Find the inverse of the matrix: **(2016)**

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

   And hence find the inverse of the following system of equations:
   $x - 2y + z = 0$
   $3x + 3y + z = 7$
   $0x + 3y + 4z = 7$

2. If **(2015)**

$$A = \begin{vmatrix} 3 & -5 \\ -4 & -2 \end{vmatrix}, \text{ Show that } A^2 - 5A - 14I = 0$$

3. Solve the equation by Matrix inverse method: **(2015)**
   $2x - y + 3z = 1$
   $x + 2y - z = 2$
   $5y - 5z = 3$

4. Compute the inverse of the matrix : **(2015-S)**

$$\begin{vmatrix} 1 & 3 & 0 \\ -2 & 3 & 3 \\ 1 & 1 & 4 \end{vmatrix}$$

   And hence find the inverse of the following system of equations:
   $x - 2y + z = 0$
   $3x + 3y + z = 7$
   $0x + 3y + 4z = 7$

5. A contractor has accepted 5 ranch style houses, 7 cape code houses & 12 colonial style houses.The number in matrix below give amount of each type of raw material required for each type of houses: **(2015-S)**

	Steel	Wood	Glass	Paint	Labour
Ranch style house	5	20	16	7	17
Cape style house	7	18	12	9	21
Colonial style house	6	25	8	5	13

   Compute by Matrix multiplication method , the amount of each raw material the contractor should obtain to fulfil the contract.

6. **(2012)**
   a) If $A = \begin{vmatrix} 1 & 3 & 0 \\ 1 & 1 & 0 \\ 4 & 1 & 0 \end{vmatrix}$ and $B = \begin{vmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 5 & 1 \end{vmatrix}$

   Find AB , BA and show that $AB \neq BA$.
   b) Show that :

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

| a b x+c |

7. **(2012)**

a) Find the adjoint of the matrix:

$$A = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{vmatrix}$$

b) Define the following :

i. Matrix
ii. Transpose Matrix
iii. Determinants

Unit-III- Linear Programming

1. A firm manufacturing two types of electrical items, A & B ; can make profit of Rs. 20 per unit of A & Rs.30 per unit of B. Each unit of A requires 3 motors & 2 transformers & each unit of B requires 2 motors & 4 transformers. The total supply of these per month is restricted to 210 motors & 300 transformers. Type B is an export model requiring a voltage stabilizer, which has a supply restricted to 65 units per month. **(2016)**
   i. Formulate above as linear programming problem for maximum profit.
   ii. Solve the above linear programming problem graphically.
2. The following matrix gives the units of material & units of labour required to produce three types of cars Mitshubishi,Ford , Alto. **(2016)**

	Mitshubishi	Ford	Alto
Units of Material	30	24	18
Units of Labour	8	11	13

If in this month's Production the cost for each unit of material is Rs. 2,500 & the cost of each unit of labour is Rs.3,300. What is the cost of manufacture these three types of cars?

3. **(2015)**

a. A horticulture wishes to mix fertilizer that will provide Minimum of 15 units of Potash, 20units of nitrate & 24 units of phosphate. Brand1I provide 3 units of potash, 1 unit of nitrate & 3 units of phosphate; it costs Rs.120. Brand 2 provides 1 unit of potash,5 units of nitrate & 2 units of phosphate ; it cost Rs.60. Express the least cost combination of fertilizers that will meet the desired specifications as equation & inequalities.

b. Solve the following LPP by graphical method:

Min $Z = 6X_1 + 14X_2$

$5X_1 + 4X_2 >= 60$

$3X_1 + 7X_2 <= 84$

$X_1 + 2X_2 >= 18$

$X_1 , X_2 >= 60$

4. Explain the following (Any 4): **(2015)**
   i. L.P.P
   ii. Graphical Method
   iii. Constraints
   iv. Alternative courses of action
   v. Objective function
5. The ABC Company has been a producer pf picture tube for television sets & certain printed circuits for radios. The company has just expanded into full scale production & marketing of AM & AM-FM radios.It has built a new plant that can operate 48hrs per week. Production of an AM radio in the new plant will require 2hrs & production of an AM-FM radio will require 3hrs each. AM radio will contribute Rs.80 to profits. The marketing department of 15AM radios & 10 FM radios can be sold each week : **(2015-S)**
   i. Formulate a linear programming model to determine the optimal production mix of AM-FM radios that will maximize profit.
   ii. Solve the problem using graphic method.
6. A firm manufactures headache pills in two sizes A & B . Size A contains 2 grains of aspirin ,5grains of bicarbonate & 1 grain of codeine; Size B contains 1 grains of aspirin ,8grains of bicarbonate & 6 grain of codeine. It has been found by users that it requires at least 12 grains of aspirin,74 grains of bicarbonate & 24 grains of codeine for providing immediate effects. Determine graphically the least number of pills a patient should have to get immediate relief.**(2012)**
7. **(2012)**

a) Define the following:

i. Objective Function
ii. Optimal Solution

b) Use Graphical method to solve the following linear programming problem:

Maximize $Z = 20x_1 + 30x_2$

Subject to $3x_1 + 2x_2 \leq 210$

$x_1 + 2x_2 \leq 150$ and $x_1 , x_2 \geq 0$