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**DMI-ST. EUGENE UNIVERSITY**  
**DEGREE EXAMINATION – JANUARY– 2023**

**SEM: II**

**800MA202 MATHEMATICS II**

Time: 3 Hours

Max. Marks: 100

Answer any Five questions (5 x 20 = 100 Marks)

1. a) Define the following: [4 Marks]
  - i. Linear Programming Problem (LPP)
  - ii. linear constraints.
- b) What are the steps to solve the L.P.P by Graphical method? [4 Marks]
- c) Solve the following LPP by graphical method. Minimize  $z=5x_1+4x_2$   
subject to constraints:  $4x_1+x_2 \geq 40$ ;  $2x_1+3x_2 \geq 90$ ; and  $x_1, x_2 \geq 0$  [12 Marks]
2. a) Determine the inverse of matrix  $A = \begin{pmatrix} 3 & -2 \\ 7 & 4 \end{pmatrix}$  [5 Marks]
- b) Find the Determinant of the given matrix  $B = \begin{bmatrix} 1 & 4 & -3 \\ -5 & 2 & 6 \\ -1 & -4 & 2 \end{bmatrix}$ . [5 Marks]
- c) Solve the following system of equations by matrix method.  
 $x + y + z = 4$ ,  $2x - 3y + 4z = 33$ ,  $3x - 2y - 2z = 2$ . [10 Marks]
3. a) Examine the continuity of the function  $f(x) = 2x^2 - 1$  at  $x = 3$ . [4 Marks]
- b) Find  $\frac{dy}{dx}$  when  $x$  and  $y$  are connected by  $x^3 + y^3 = 3axy$ . [4 Marks]
- c) If  $x = 2\cos t - \cos 2t$ ,  $y = 2\sin t - \sin 2t$ , find the value of  $d^2y/dx^2$  at  $t = \frac{\pi}{2}$ . [12 Marks]
4. a) Mention any four methods of integration. [4 Marks]
- b) Solve  $\int \frac{2x^2 - 14x + 24}{x-3} dx$ . [4 Marks]
- c) Find the integration for  $dy/dx = 2x/5x^2 + 1$  with limiting values as 0 and 1. [12 Marks]

5. a) Find by integration, the area of the region bounded by the lines  $5x-2y=15$ ,  $x+y+4=0$  and the x axis. [10 Marks]

b) i) The curve  $y = x^2 + 4$  is rotated one revolution about the x-axis between the limits  $x = 1$  and  $x = 4$ . Determine the volume of the solid of the revolution produced.

ii) Determine the area enclosed by the two curves  $y = x^2$  and  $y^2 = 8x$ . [10 Marks]

6. a) Let  $f(x) = x^2$  and  $g(x) = \sqrt{1-x^2}$ . Find  $g \circ f(x)$  and  $f \circ g(x)$ . [4 Marks]

b) If  $f(x)=2x+3$ ,  $g(x)=1-2x$  and  $h(x)=3x$ . Prove that  $f \circ (g \circ h) = (f \circ g) \circ h$ . [4 Marks]

c) A furniture dealer deals only with two items; tables and chairs. He has to invest k10000 and a space to store almost 60 pieces. A table cost him k500 and a chair cost k200. If he sells all the items, he can get a profit of k50 per table and k15 per chair. Formulate this problem as an LPP so as to maximize the profit. [12 Marks]

7. a) If  $A = \begin{bmatrix} 5 & -1 \\ 3 & 2 \end{bmatrix}$ , and  $B = \begin{bmatrix} -4 & 3 \\ 1 & -2 \end{bmatrix}$ , find the matrix X such that  $3A - 2B + 3X = 0$ .

[4 Marks]

b) Simplify  $\cos \theta \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix} + \sin \theta \begin{bmatrix} \sin \theta & -\cos \theta \\ \cos \theta & \sin \theta \end{bmatrix}$  [4 Marks]

c) If  $A = \begin{bmatrix} 5 & -1 \\ 3 & 2 \end{bmatrix}$ , and  $B = \begin{bmatrix} -4 & 3 \\ 1 & -2 \end{bmatrix}$ , find the matrix X such that  $3A - 2B + 3X = 0$ .

[12 Marks]