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MANIPAL ACADEMY OF HIGHER EDUCATION

(Deemed University)

DUBAI CAMPUS

FIRST SEMESTER B.B.A. DEGREE EXAMINATION – JANUARY 2007

SUBJECT: MATHEMATICS FOR BUSINESS (MAT 101)

Monday, January 29, 2007

Time: 3 Hrs. Max. Marks: 100

Answer any Five Questions **5 * 20 = 100 Marks**

1. a] Explain ten types of matrices with suitable examples.

   b] Explain five properties of determinant.

2. a] Find the inverse of the matrix $\begin{bmatrix} 4 & 0 & 2 \\ 2 & 10 & 2 \\ 3 & 9 & 1 \end{bmatrix}$.

   b] Abinaya Ltd. produces three products X, Y and Z on three different types of machines installed in three departments A, B and C. The departmental monthly capacity is limited to:

Department	Machine hrs
A	1800
B	2100
C	1300

The machines are purpose built and each type can perform its specialised task only. The three products are proposed in all three departments but take varying time in each as follows:

Products	Departments (Hours / units)		
	A	B	C
X	2	6	1
Y	2	1	3
Z	3	2	2

The production controller has been instructed to obtain the fullest possible utilisation of all machines. Calculate the number of units of products X, Y and Z to be produced in order to fill the capacity of all three departments for the months. **Use the help of determinant to solve.**

3. a] Use Gauss Elimination method to solve:

$$\begin{aligned} 2x \quad - z &= 3 \\ 2x + 4y - z &= 15 \\ x - 8y - 3z &= -30 \end{aligned}$$

b]

A factory produces three types of packet radio sets called Ind1, Ind2 and Ind3. Ind1 contains 1 transistor, 8 resistors and 4 capacitors, while Ind2 contains 2 transistors, 16 resistors and 8 capacitors, and Ind3 contains 3 transistors, 24 resistors and 12 capacitors. (i) Express the above furnished information in the matrix form.

(ii) Find the monthly consumption of the raw materials if the monthly output of sales is 200 Ind_1, 300 Ind_2 and 100 Ind_3.

4. a] Differentiate with respect to x:
   (i) $y = x^y$ ii) $Y = (2x^2 - 1) / (2x + 3)$

   b] A firm produces x units of output at a total cost $C[x] = [x^3/10] - [9/x^2] + 85x + 17$.
   Find the average cost, average variable and the minimum C[x].

5. a] Suppose the demand function of some article is $p(x) = 75 - 2x$ and the cost function is $C(x) = 350 + 12x + [x^2/4]$, find the number of units and the price at which the total profit is maximum. What is the maximum profit?

   b] Evaluate $\int x e^{x^2} dx$

6. a] Evaluate $\int \frac{3x^5 - 2x^3}{[x^6 - x^4]^5} dx$

   b] The revenue (in \$) from the sale of x units of a product is given by

$$R(x) = \frac{3000}{2x+2} + 80x - 1500$$

   i] Find the marginal revenue when 149 units are sold.

   ii] Find the maximum revenue.

7. a] The XYZ company limited has approximated the marginal revenue function for one of its products by $MR = 20x - 2x^2$. The marginal cost function is approximated by $MC = 81 - 16x + x^2$. Cost is 40 when $x = 1$. Determine the Revenue function.

b] Evaluate $\displaystyle\int \frac{dx}{[x+1][x+2]}$