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ABA 205: MANAGEMENT MATHEMATICS II

MAY-AUGUST 2014 SEMESTER EXAMS TIME: 2HOURS

INSTRUCTIONS: ANSWER QUESTION 1 AND ANY OTHER TWO.

1.(a) Given the matrices

$A = \begin{pmatrix} 1 & -4 \\ 0 & -9 \end{pmatrix}$ $B = \begin{pmatrix} 4 & 3 \\ -7 & 0 \end{pmatrix}$ $C = \begin{pmatrix} 5 & -1 & -1 \\ 12 & 0 & 2 \end{pmatrix}$

Calculate :

i. A + 4B(4mks)

ii. $(BC)^T$(4mks)

(b). Solve the following simultaneous equations by using matrix algebra

5x +9y = -30

6x – 2y= 28 (5mks)

(c) Define markov chain and state the four conditions it must satisfy (5mks)

(d) outline four purposes of input-output analysis (4mks)

(e) A factory produces four products A, B, C and D which earns contribution of £20, £25, £12 and £30 per unit respectively. The factory employs 500 workers who work a 40 hour week. The hours required for each product and the material requirements are set out below:

products

	A	B	C	D
Hours per unit	6	4	2	5
Kg material x per unit	2	8.3	5	9
Kgs material y per unit	10	4	8	2
Kgs material z per unit	1.5	-	2	8

The total availability of materials per week is:

X 100,000kg

Y 65,000kg

Z 250,000kg

The company wishes to maximize contribution

Formulate the L.P problem in the standard manner (4mks)

f(i) Calculate dy/dx and dy/dx^2 for the following functions of x

$y=12- 10x +6x^2 – 2x^3$ (4mks)

2(a) Affirm engaged in producing two models, model x_1 and x_2 performs only three operations – painting, assembly and testing. The relevant data are as follows:

Unit sale price	Hours required for each unit		
	Assembly	Painting	Testing
Model x_1 Rs 50	1.0	0.2	0.0
Model x_2 Rs 80	1.5	0.2	0.1

Total number of hours available each week is as under:

Assembly 600

Painting 100

Testing 30

The firm wishes to determine its weekly product mix so as to maximum revenue. Write up the model and then solve the product mix graphically. (10mks)

(b) Solve the following simultaneous equations by using matrix algebra

$X_1+2x_2+x_3 = 3$

$2x_1 +3x_2 +2x_3 = 1$

$3x_1 +4x_2 +x_3 = -2$ (10mks)

3.(a) Write short notes on the following as used in markov analysis:

i. Transition probabilities (2mks)
ii. Cyclic chains (2mks)
iii. Steady states (2mks)
iv. Absorbing states (2mks)
v. Transient analysis (2mks)

(b) Given the following transition matrix obtain the input –output matrix.

Production sector	Purchase sector		Projected Demand
	Agriculture	Industry	
Agriculture	300	600	100
Industry	400	1200	400

If the projected demand changes to 200 and 800 units respectively, what should be the gross output of each sector in order to meet the new demands? (10mks)

4.(a) Write short notes on the following:

i. Input –output tables (2mks)
ii. Technical coefficients (2mks)
iii. Final demands (2mks)
iv. Leontief inverse matrix (2mks)

b.i Solve the following simultaneous equations algebraically

$x + 3y = 4$ (4mks)

$-x + 2y = 6$

ii.intergrate (i) x^2+1/x^2 (4mks)

(ii) $5x - 3x^2$ (4mks)

5.(a) Determine the first, second and third derivatives of the following demand function.

i. $P = 25Q^4 - 10Q^2 + 200$ (6mks)

Evaluate $\lim_{x \to 1} \frac{x^2-1}{x-1}$ (4mks)

(b) A fast food chain has three shops, A, B and C. the average daily sales and profit in each shop is given in the following table:

	Units sold			Units profit		
	Shop A	Shop B	Shop C	Shop A	Shop B	Shop C
Burger	800	400	500	20p	40p	33p
Chips	950	600	700	50p	45p	60p
Drinks	500	1200	900	30p	35p	20p

Use matrix multiplication to determine:

(a) The profit for each product (5mks)

(b) The profit for each shop (5mks)