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RAJARATA UNIVERSITY OF SRI LANKA

FACULTY OF APPLIED SCIENCES, MIHINTALE

B.SC (General) Degree

First Year – Semester I Examination – May / June 2016

FDN 1306 Basic Mathematics for non-mathematics students

Answer **ALL** Questions. Time allowed: **Three Hours.**

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1. (a) Given that $10^{0.30105} = 2$ write down the values of

(*i*) $\log_{10} 2$ (*ii*) $\log_{10} 200$ **[10 Marks]**

(b) Without tables, simplify $3\log 4 + 2\log 3 - 5\log 2 - \log 6$. **[10 Marks]**

(c) Solve the equation: $\log\{7(3^{x-1})\} = \log\{2(5^{2x+1})\}$ for a possible value of x. **[25Marks]**

(d) Solve the following word problems, by first converting them into algebraic equations:

(i) In a given amount of time, Jagath drove twice as far as Ramesh. Altogether they drove 90 miles. Find the number of miles driven by each. **[15Marks]**

(ii) Kawitha works for \$6 an hour. A total of 25% of her salary is deducted for taxes and insurance. She is trying to save \$450 for a new car stereo and speakers. How many hours must she work to take home \$450 if she saves all of her earnings? **[20Marks]**

(iii)Jack has a board that is 44 inches long. He wishes to cut it into two pieces so that one piece will be 6 inches longer than the other. How long should the shorter piece be? **[20Marks]**

(c) A manufacturer determines that when x thousand units of a particular commodity are produced, the profit generated will be $P(x) = -400x^2 + 6800x - 12000$ dollars.

At what rate is profit changing with respect to the level of production x when 9000 units are produced? **[20 Marks]**

Is profit increasing or decreasing at this time? **[10 Marks]**

4. (a) If $A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$, then show that $(AB)^{-1} = B^{-1}A^{-1}$. **[20 Marks]**

(b) You are in charge of catering for a university function. To limit the cost, you will serve only two entrees. One is a vegetarian dish that costs Rs. 600 and the other is a chicken dish that costs Rs. 800. If there will be 150 people at the function and your budget is Rs. 100,000.

(i) Formulate a system of linear equations to represent the above model. **[20 Marks]**

(ii) Express the model which was obtained in part(i) in the form of $AX = b$, where A, X and b are **matrices to be identified**. **[20 Marks]**

(iii) Use the Cramer's rule to find how many of each type of entree will be served.

[40 Marks]

5. (a) After initiating an advertising campaign in an urban area, a satellite dish provider estimates that the number of new subscribers will grow at a rate given by $\frac{dN}{dt} = 15t^{4/3} + 37$ subscribers per month, where t is the number of months after the advertising begins.

How many new subscribers should be expected 8 months from now? **[40 Marks]**

(b) Use the substitution $u = 4x^2 - 3$ to evaluate the integral $\int 8x(4x^2 - 3)^5 dx$. **[30 Marks]**

(c) Find the area enclosed by the curve $r(\theta) = \sin\theta + \cos\theta$, $0 \le \theta \le \frac{\pi}{2}$. **[30 Marks]**