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University of Sri Jayewardenepura
2011 – B.Sc. Business Administration (General) External Degree
Part I Examination – May 2014

BME 1503 - Business Mathematics & Statistics

Time Allowed : Three (3) Hours
Instructions : Answer Any **FIVE** Questions
All Questions Carry Equal Marks
Calculators are allowed

Question One

(a) Simplify, $\left(\frac{4x^{-4}y^5}{2x^{-2}}\right)^3 \times \frac{x^3y^4}{\sqrt{x^2y^2}}$.

(b) Find the factors of the following expressions.

(i) $8x^4y - 64xy^4$

(ii) $ax^3 + bx - ax - b$

(c) A company manufactures three products X, Y and Z, each of which must go through three processes A, B, and C for the following times.

Product	Time spent in process		
	A	B	C
X	3	3	1
Y	3	2	3
Z	2	0	1

The maximum capacities of processes A, B and C are 130, 85 and 60 respectively. Calculate the number of units to be produced from products X, Y and Z to ensure the utilization of maximum capacity.

Question Two

(a) Differentiate the following functions with respect to x .

(i) $y = \frac{6}{x^3} + 5x^{-2} - 30$

(ii) $y = \frac{(3x^2 + 2)^3}{2x + 5}$

(b) A company invests money in a particular project and it has been estimated that after x months, the cumulated profit (in thousand rupees) from the project is given by the function $p(x) = -3x^2 + 31.5x - 60$, where x represents time in months. The project can run for nine months at the most.

- (i) Draw a graph which represents the cumulative profit function.
- (ii) Calculate the break-even time points for the project.
- (iii) What is the initial cost of the project?
- (iv) Use the graph to estimate the best time to end the project.

(c) A company has found that the number of units sold of a product can be determined by the function $S(x)$ if Rs. x (in thousand) are spent on advertising.

Where $S(x) = -2x^3 + 27x^2 + 132x + 207$ $0 \leq x \leq 17$

- (i) How many units could be sold if no money is spent on the advertising?
- (ii) Using the differentiation find the amount to be spent on advertising to maximize the number of units sold and that maximum quantity.

Question Three

a) (i) Find the integral of $\int \left(\frac{2}{x^2} - x^3 + 10 \right) dx$

(ii) Evaluate $\int_2^4 (4 + \sqrt{x})^2 dx$

- (a) Quantity demanded and the corresponding price, under pure competition, are determined by the demand and supply functions $p = 36 - q^2$ and $p = 16 + \frac{q^2}{4}$, respectively. Determine the corresponding consumer's surplus and the producer's surplus.
- (b) Amal borrowed Rs.50,000 at an interest rate of 11% compounded quarterly. At the end of each year for the next three years he agrees to make payments of Rs.15,000 each. What payment made at the end of the fourth year will extinguish the debt?

Question Four

- (a) Explain, how central tendency measurements and dispersion measurements important when you analyze a given set of data.
- (b) The ages of the employees of "Southern Bakers" are as follows,
 - 19, 19, 65, 20, 21, 18, 20
 - (i) Calculate the mean, median and mode of the ages.
 - (ii) Without calculating, explain how could these three measures of central location be affected if the oldest employee retires.
- (c) "AUTORUN" car rental agency recently bought 100 identical new small cars from a major car manufacturing company. After first 1000km break-in-period, obtained the following fuel consumption data.

Fuel Consumption (km per liter)	Number of Cars
9 - 10	9
11 - 12	13
13 - 14	24
15 - 16	38
17 - 18	16

- (i) Calculate the mean fuel consumption and the variance of fuel consumption for above data.
- (ii) Determine the coefficient of variation of the data.
- (iii) Which rental agency is better if coefficient of variation of fuel consumption of "FASTRUN" car rental agency is 20? Explain.

