 Serial No……

# Society of Certified Management Accountants of Sri Lanka

## Technician Stage
## March 2008 Examination

**Examination Date :** 15th March 2008 **Number of Pages :** 07
**Examination Time:** 9.30a:m.-11.30a:m. **Number of Questions:** 07

**Instructions to the Candidates**

1. Time allowed is **two (2)** hours
2. Answer **any five(5)** questions
3. Answers should be entirely in the **English** language

| Subject | Subject Code |
|---|---|
| **Business Mathematics** | **(BMT)** |

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**Question No. 1 (20 Marks)**

(a) Find the matrix X such that A (B + X) = C, **(7 Marks)**
Where,

$$A = \begin{bmatrix} 5 & 3 \\ -2 & -1 \end{bmatrix}, B = \begin{bmatrix} 6 & -3 \\ 7 & -3 \end{bmatrix} \text{ and } C = \begin{bmatrix} 2 & 1 \\ 1 & -1 \end{bmatrix}$$

(b) In three consecutive years the population of a town has increased by 2%, 3% and 5%. Find the percentage increase of the population in the three years. **(7 Marks)**

(c) In how many ways Rs.57/- could be paid in cents 50 coins and Rs.5/- coins, using both coins or only one coin? **(6 Marks)**

**(Total 20 Marks)**

**Question No. 2 (20 Marks)**

(a) Certain mass-produced articles of which 5% are defective are packed in cartons of 100. Find the percentage of cartons that contain 2 or more defectives using

(i) The binominal distribution. **(5 Marks)**

(ii) The Poisson distribution. **(5 Marks)**

(b) A team of three is to be chosen from 4 women and 5 men. If X is the random variable of the number of women in the team,

(i) Prepare the probability distribution of X. **(4 Marks)**

(ii) Find the expected value of X. **(3 Marks)**

(iii) Find the variance of X. **(3 Marks)**

**(Total 20 Marks)**

**Question No. 3 (20 Marks)**

(a) In how many different ways

(i) Can 6 runners win the first 2 places in a race? **(2 Marks)**

(ii) Can 6 gentlemen be seated in a bench with 2 special gentlemen always at the two ends? **(2 Marks)**

(iii) Can 2 professorships be conferred to two persons from 6 distinguished persons? **(2 Marks)**

(iv) Can 2 trophies of a tournament be donated to 6 players if each player can obtain both? **(2 Marks)**

(v) Can 2 prizes in the same lottery be given to 6 winners, if each person can win both prizes? **(2 Marks)**

(vi) Can 6 letters be put into 2 post boxes? **(2 Marks)**

(b) A deposit of $\boldsymbol{P}$ rupees is made at the beginning of each month in an account at an annual interest rate $\boldsymbol{r}$, compounded monthly.
The balance $\boldsymbol{A}$ after $\boldsymbol{t}$ years is given by

$$A = P\left(1+\frac{r}{12}\right) + P\left(1+\frac{r}{12}\right)^2 + \ldots\ldots\ldots\ldots + P\left(1+\frac{r}{12}\right)^{12t} \quad ,$$

(i) Shows that

$$A = P\left[\left(1+\frac{r}{12}\right)^{12t} - 1\right]\left(1+\frac{12}{r}\right)$$

**(5 Marks)**

(ii) Evaluate $\boldsymbol{A}$ when $\boldsymbol{r}$ = 6%, $\boldsymbol{t}$ = 10 and $\boldsymbol{P}$ = 5000, **(3 Marks)**

**(Total 20 Marks)**

**Question No. 4 (20 Marks)**

(a) The supply function for a certain commodity is $S(P) = P - 60$ and the demand function is $D(P) = \left(\frac{1600}{P}\right)$, where $P$ is the price per unit.

(i) Find the equilibrium price and the corresponding number of units supplied and demanded. **(6 Marks)**

(ii) Draw the supply and demand curve on the same set of coordinate axes. **(6 Marks)**

(iii) At which point does the supply curve cross the $P$ axis? Describe the economic significance of this point. **(3 Marks)**

(b) The weight $w$(in Kg) and the height $h$ (in metres) for normal children aged 5 through 13 years old are approximately related by the formula

$$\ell n\ 2.4 + 1.84h = \ell n\ w$$

(i) Express $w$ in terms of $h$. **(3 Marks)**

(ii) If the height of a randomly selected child is 1.2 metres, find his / her probable weight. **(2 Marks)**

**(Total 20 Marks)**

**Question No. 5 (20 Marks)**

(a) ETA sales company must determine how many basic model items to order from its supplier. Sales run 150 units per year, wholesale cost to ETA is Rs.375/- per item, fixed order cost is Rs.10/-, and carrying charges (holding costs) run 12% on an annual basis.

(i) Determine the economic order quantity, Q. **(3 Marks)**

(ii) By finding minimum total annual inventory costs, determine the optimal discrete order quantity (The nearest whole number of Q). **(3 Marks)**

(iii) Assuming that ETA will ship items only in lots of 3 at a time, determine the economic order quantity. **(3 Marks)**

(iv) Sketch the graph of total annual inventory cost against economic order quantity. **(3 Marks)**

(b) The trend equation describing the monthly sales, in thousands of units for a large manufacturer of small items is
$y = 2.50 + 456\,t$, where $t$ is in months.

(i) Determine the projected number of items sold in April of the sixth year. **(4 Marks)**

(ii) The seasonal index for the month of April is 75.0. Determine the seasonally adjusted sales forecast for April of the sixth year. **(4 Marks)**

**(Total 20 Marks)**

**Question No. 6 (20 Marks)**

(a) A manufacturer of certain items makes two models Q and R. Three assembly lines I, II and III are used in the production of the items. The hours spent in each assembly line are shown in the table.

| | Assembly Line | | |
|---|---|---|---|
| | **I** | **II** | **III** |
| **Q** | 1 | 1 | 2 |
| **R** | 1 | 2 | 1 |

Assembly lines I, II and III are used for no more than 40, 60 and 70 hours per week, respectively. The model Q sells at a profit of Rs.3000 and the model R shows a profit of Rs.4000. How many of each model should be made in order to maximize the manufactures profit? What is the weekly profit? **(10 Marks)**

(b) The activity times and precedent relations are given below for a project.

| **Activity** | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | **J** |
|---|---|---|---|---|---|---|---|---|---|---|
| Precedent relation | - | A | A | A | B | E | C | D | G,H | F,I |
| Activity Time | 4 | 3 | 7 | 9 | 11 | 4 | 6 | 3 | 7 | 11 |

(i) Construct a network for the project. **(7 Marks)**

(ii) Find the critical path. **(3 Marks)**

**(Total 20 Marks)**

**Question No. 7 (20 Marks)**

(a) An examination board decided to fail 20% of the students in statistics. Examination marks are normally distributed, with a mean of 70.4 and a standard deviation of 10. What is the minimum mark a student should get to pass in statistics? **(6 Marks)**

(b) The following sample of five measurements was randomly selected from a normally distributed population:

3, 4, 4, 6, 7

(i) Find the mean of the sample. **(3 Marks)**

(ii) Find the standard deviation of the sample. **(4 Marks)**

(iii) Use the t-distribution to find a 95% confidence interval for the population mean $\mu$. **(7 Marks)**

**(Total 20 Marks)**

## List of Formulae

1. **Sum to *n* terms of an arithmetic progression:**

$$S_n = \frac{n}{2}\left[2a + (n-1)d\right]$$

Where, $a$ = first term
$d$ = common difference
$n$ = number of terms
$S_n$ = sum to $n$ terms

2. **Small sample confidence interval for mean of a population:**

$$C.I. = \bar{x} \pm t_{\frac{\alpha}{2}}\left(\frac{s}{\sqrt{n}}\right),$$

Where, $\bar{x}$ = sample mean
$s$ = sample standard deviation
$n$ = sample size
$\alpha$ = significance level with $n$ - 1 degrees of freedom

End of Question Paper