# Quantitative Methods 

Foundation Examination
Autumn 2013
Module A

3 September 2013
100 marks - 3 hours
Additional reading time - 15 minutes
Q. 1 (a) Chemicals A \& B are formed by mixing $x, y$ and $z$ in the ratio of 8:3:4 and 4:3:8 respectively. The cost per litre of $\mathrm{x}, \mathrm{y}$ and z is Rs. 300, Rs. 240 and Rs. 180 respectively. Chemical C is produced by mixing Chemicals A \& B in a certain ratio.

If total cost of producing 1,000 litres of Chemical C is Rs. 252,000 find the ratio of Chemicals A \& B in Chemical C.
(b) Nasim Electronics Limited has designed a household appliance. It has estimated that 1000 units would be produced during the first month. Thereafter, the production would increase at $5 \%$ per month for the next 24 months and then start declining by $12 \%$ per month till it reaches 250 units per month after which the production would be discontinued.

Compute the total number of units that the company would produce.
Q. 2 (a) In October 2011 Aslam had deposited an amount in an investment scheme at $12 \%$ interest compounded quarterly, with the objective of receiving Rs. 1,000,000 at the end of the $5^{\text {th }}$ year i.e. October 2016. He has been informed that with effect from 1 October 2013 the interest rate on the scheme for the remaining period would be reduced to $10 \%$.

Determine the amount that Aslam should deposit on 1 October 2013 to have the required amount in October 2016.
(b) Kiran deposited Rs. 5,000 per month (first day of the month) in a saving account in the year 2011 and Rs. 7,500 per month in the year 2012. Find the total amount saved by her at the end of year 2012 if she earned interest @ $8 \%$ compounded monthly.
(c) Find the face value of a bill which was discounted by a bank for Rs. 95,000 five months before maturity, at a discount rate of $12 \%$
Q. 3 (a) If $y=e^{2 x^{2}} \ln a x^{3}$

Prove that $\frac{d y}{d x}=\frac{1}{x}\left(4 x^{2} y+3 e^{2 x^{2}}\right)$
(b) The average cost and total revenue functions for " q " number of memory cards are as follows:

$$
\begin{aligned}
& \mathrm{AC}=\mathrm{q}+20+\frac{1500}{\mathrm{q}} \\
& \mathrm{TR}=860 \mathrm{q}-3 \mathrm{q}^{2}
\end{aligned}
$$

Calculate the maximum profit that can be earned and the price at which the profit would maximise.
Q. 4 (a) Solve the following system of equation by using Cramer's Rule:

$$
\begin{align*}
& x-y-5 z=4 \\
& 2 x-3 y-3 z=3 \\
& 3 x-2 y-7 z=2 \tag{08}
\end{align*}
$$

(b) Sketch the feasible region for the following set of constraints:

$$
\begin{equation*}
x \leq 5 \quad y \geq 2 \quad x+y \leq 8 \tag{04}
\end{equation*}
$$

Q. 5 (a) Draw a histogram and a frequency polygon for the following frequency distribution relating to the ages of the students in a school:

| Students' ages (years) | $6-7$ | $8-9$ | $10-12$ | $13-15$ | $16-19$ |
| :--- | :---: | :---: | :---: | :---: | :---: |
| No. of students | 6 | 8 | 21 | 15 | 16 |

(b) Calculate the median, mean deviation from median and coefficient of mean deviation from median of the following frequency distribution:

| Class intervals | $0-9$ | $10-19$ | $20-29$ | $30-39$ | $40-49$ |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Frequency | 10 | 14 | 24 | 15 | 09 |

Q. 6 (a) The marks obtained by eight students in a competency test are as follows:

| Student ID | $A$ | $B$ | $C$ | $D$ | $E$ | $F$ | $G$ | $H$ |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Accounting | 78 | 80 | 80 | 85 | 65 | 60 | 69 | 72 |
| Mathematics | 90 | 87 | 85 | 75 | 75 | 75 | 70 | 73 |

Find out the Spearman's coefficient of rank correlation for the above marks and interpret the result.
(b) Find out the regression coefficient of y on x , if regression coefficient of x on y is 0.25 and the coefficient of correlation between x and y is 0.6 .
Q. 7 (a) Inaam is going to play a series of 3 tennis matches with Misbah. Assuming that chances of winning and losing are equal, find the following probabilities for Inaam:
(i) Two wins and one loss
(ii) At least two wins
(iii) No loss
(iv) At most two losses
(b) APZ Limited produces a component having a diameter of 3.0 cm . A customer has ordered 100,000 units and has indicated that he would be willing to accept a variation of up to 0.01 cm . The diameter of the component has a normal distribution with mean of 3.0 cm and standard deviation $=0.005 \mathrm{~cm}$.

Estimate the number of components that the customer would reject.
(c) Small Insurance Company receives an average of 8 insurance claims daily during the month of Ramadan every year. Using Poisson distribution, find the probability that on a certain day in Ramadan the company will receive:
(i) no insurance claim.
(ii) less than four insurance claims.
(iii) at least two insurance claims.
Q. 8 (a) Find the probability of getting a sample mean within the range of $1.3 \%$ of the population mean, if a sample of 36 packages is drawn at random from a population having standard deviation of $4 \%$ of the population mean.
(b) Heights in inches, of ten individuals chosen at random from a normal population, are as follows:

$$
63,63,66,67,68,69,70,70,71,71
$$

In the light of the above data, discuss the suggestion that the mean height of the population at significance level of $\alpha=0.05$ is 66 inches.
(THE END)

