

# CS/ MBA/ SEM-1 (FT \& PT)/ MB-105/ 2012-13 2012 QUANTITATIVE METHODS - I 

Time Allotted : 3 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Graph sheet(s) will be supplied by the Institute on demand.

## GROUP - A <br> ( Multiple Choice Type Questions )

1. Choose the correct alternatives for any ten of the following :

$$
10 \times 1=10
$$

i) For what value of $x$, the function $f(x)=\sqrt{x}$ is not defined?
a) 0
b) 1
c) - 1
d) any negative integer.
ii) The irrational function from the following is
a) $x^{1 / 3}$
b) $\left(2 x^{3}+5\right)^{1 / 2}$
c) $x$
d) both (a) and (b).
iii) The odd function of the following is
a) $2 x^{2}+5$
b) $3 x^{3}+5 x$-rantinim
c) $5 x^{4}+11$
d) $\quad 1$.
iv) $\int x^{89} \mathrm{~d} x$ is
a) $89 x^{99}$
b) $90 x^{90}+c$
c) $x^{90} / 90+c$
d) $\quad 1$.
v) If $y=19 x$, then $\frac{\delta^{2} y}{\delta x^{2}}$ is
a) 19
b) $19 x^{2}$
c) 0
d) $\quad 1$.
vi) $\frac{\mathrm{d}}{\mathrm{d} x}$ of $6^{x}$ is
a) $\quad 6{ }^{x} \log _{e} 6$
b) $6^{x}$
c) $\log _{e} 6$
d) $\quad 1$.
vii) Coefficient of variation is found by using the formula
a) $\left(\frac{\sigma}{\bar{x}}\right) 100$
b) $\left(\frac{\sigma}{\bar{x}}\right) 10$
c) $\left(\frac{\bar{x}}{\sigma}\right) 1000$
d) $\sigma \bar{x}$.
viii) Mean Deviation is equal to
a) $2 \times$ S.D.
b) $\frac{4}{5} \times$ S.D.
c) $\frac{2}{3} \times$ S.D.
d) all of these.
ix) Age of applicants for LIC and the insurance premium have correlation
a) negative
b) positive
c) zero
d) 1 .
x) If two variables are independent, then their correlation coefficient is
a) $r=0$
b) $r=+1$
c) $r=-1$
d) $\quad r=0.5$.
xi) The Struges rule for obtaining the number of classinterval is
a) $\quad K=1-3.322 \log \mathrm{~N}$
b) $\quad K=1+3 \cdot 322 \log \mathrm{~N}$
c) $\quad K=1-2 \cdot 322 \log \mathrm{~N}$
d) $K=1+2 \cdot 322 \log \mathrm{~N}$.
xii) Total number of arrangement of the letters of the word STATISTICS is
a) 3360
b) 504
c) 16800
d) 50400 .
xiii) The value of the second derivative at the point of maximum value is
a) negative
b) positive
c) zero
d) none.
xiv) The sum of deviations taken from their A.M. is always equal to
a) one
b) zero
c) depends on values
d) 2 .
xv) Mode of $15,12,5,13,12,15,8,8,9,9,10,15$ is
a) 15
b) 12
c) 8
d) 9 .

# GROUP - B <br> ( Short Answer Type Questions) 

Answer any three of the following.
$3 \times 5=15$
2. a) Find domain of $f(x)=\frac{x^{2}+x+5}{x^{2}-6 x+8}$.
b) Evaluate $\lim _{x \rightarrow-1} \frac{2 x^{2}-x-3}{x^{2}-2 x-3}$.
3. The following is the distribution of salaries of 20 workers of a company :

| Salary group | $1000-2000$ | $2000-3000$ | $3000-4000$ | $4000-5000$ |
| :---: | :---: | :---: | :---: | :---: |
| No. of workers | 3 | 6 | 7 | 4 |

The company gave bonus of Rs. 500, Rs. 800, Rs. 1,200 and Rs. 1,500 to the salary groups respectively. Find the average bonus per worker.
4. Find the number of ways in which four groups of three each can be formed from twelve persons.
5. Find $\frac{\partial(x, y)}{\partial(u, v)}$ where $u=x^{2}+y^{2}, v=2 x y$.
6. A bag contains 4 red, 4 white and 5 green balls. Three balls are drawn at random. What is the probability that a red, a white and a green balls are drawn.

7. a) Prove that the minimum value of $9 e^{x}+25 e^{-x}$ is 30 .
b) $\int_{0}^{1} \frac{x \mathrm{~d} x}{\sqrt{1+x^{2}}}$, evaluate the definite integration.
c) Justify $A^{2}-4 A+3 I=0$ where,

$$
A=\left(\begin{array}{rr}
2 & -1 \\
-1 & 2
\end{array}\right), I=\left(\begin{array}{ll}
1 & 0 \\
0 & 1
\end{array}\right) . \text { If possible find } A^{-1}
$$

8. a) The results of 21 footballs ( win, loser, draw ) are to be predicted. How many different forecasts can contain exactly 18 correct results ?
b) A fair coin and a fair die are thrown. Find the probabilities of (i) head on the coin and the number 6 on the die, (ii) head on the coin and even number on the die.
c) The demand function for a particular brand of pocket calculator is $P=75-0.3 Q-0.05 Q^{2}$. Find the consumer's surplus at a quantity of 15 calculators.
(Apply integration )
9. a) If $F=f(y-z, z-x, x-y)$, prove that $\frac{\partial F}{\partial x}+\frac{\partial F}{\partial y}+\frac{\partial F}{\partial z}=0$.
b) Find the standard deviation and quartile deviation from the following data :

10

| Class | $120-124$ | $125-129$ | $130-134$ | $135-139$ | $140-144$ | $145-149$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Frequency | 12 | 25 | 28 | 15 | 12 | 8 |


10. a) Draw the histogram and cumulative frequency polygons ( more than as well as less than type) from the following table :

| Marks | $1-10$ | $11-20$ | $21-30$ | $31-40$ | $41-50$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Frequency | 5 | 13 | 12 | 10 | 8 |

Also find the median from the graph.
b) If $x^{m} \cdot y^{n}=(x+y)^{m+n}$, then prove that $\frac{\mathrm{d} y}{\mathrm{~d} x}=\frac{y}{x}$.
c) Prove De Morgan's laws for the following sets :
$U=\{2,3,4,5,6,8,9), A=\{3,5,9\}, B=\{4,6,8\}$
11. a) Show that the function $f(x)= \begin{cases}x^{2} & \text { when } x \neq 1 \\ 2 & \text { when } x=1\end{cases}$ is discontinuous at $x=1$.
b) From the following data of the wages of 50 workers of a factory compute first four moments about mean and also $\beta_{1}, \beta_{2}$. Comment on the results.

| Weekly <br> wages (Rs.) | No. of <br> workers | Weekly <br> wages (Rs.) | No. of <br> workers |
| :---: | :---: | :---: | :---: |
| $110-120$ | 1 | $180-200$ | 12 |
| $120-140$ | 3 | $200-220$ | 4 |
| $140-160$ | 7 | $220-240$ | 3 |
| $160-180$ | 20 |  |  |

c) With the help of Lagrange's Multiplier, find the minimum value of $x^{2}+y^{2}+z^{2}$, subject to the condition $2 x+3 y+5 z=30$.
12. a) Solve the following system of equations by matrix inversion method :


$$
\begin{aligned}
& 2 x-y+3 z=9 \\
& x+3 y-z=4 \\
& 3 x+2 y+z=10
\end{aligned}
$$

b) The two lines of regression are $x+2 y-5=0$ and $2 x+3 y-8=0$ and variance of $x$ is 12 . Calculate the values of $\bar{x}, \bar{y}, \sigma_{y}^{2}$ and $r$.
c) Distinguish between Primary data and Scondary data.

