MCA 1st Semester Examination, 2010

NUMERICAL COMPUTATION AND STATISTICAL COMPUTATION

PAPER—1106 (Gr.-A + B)

Full Marks : 100

Time : 3 hours

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

GROUP—A

(*Numerical Computation*)

[*Marks* : 50]

Answer **Q.No.1** and any **two** from the rest

1. Write a programme in C-language for 'Gauss Elimination' method. 5

Or

Describe 'Newton's Forward' interpolation formula. 5

2. (*a*) Find out the convergency condition of 'Iteration method' to find out the real root of an equation.

(*b*) Find out the real root of the equation $3x - \cos x - 1 = 0$ by Newton–Raphson method correct up to 3 significant figure.

(*c*) Determine the error term of Trapezoidal rule for integration. 6 + 5 + 4

3. (*a*) Describe the Gauss-Seidal method for solving a set of linear equations.

(*b*) Describe the Euler's modified method for solving initial valued first order differential equation. Is it single step method or multi-step method ? Justify.

(*c*) Write down the properties of Chebyshev polynomial. Express $f(x) = x^3$ in terms of Chebyshev polynomials. 5 + 5 + 5

4. (*a*) By Simpson's 1/3 rule, find out the value of

$$\int_{1.2}^{1.6} (x + 1/x)\, dx$$

for 8 sub-intervals.

(*b*) Show that

$$\Delta \nabla \equiv \Delta - \nabla$$

(*c*) Find the Lagrange's interpolation polynomial for the function $f(x) = \sin \pi x$, when $x_0 = 0$, $x_1 = 1/6$, $x_2 = 1/2$. Also compute $\sin \pi/3$ and estimate the error. 5 + 4 + 6

[*Internal Assessment* : 15 Marks]

GROUP—B

(*Statistical Computation*)

[*Marks* : 50]

Answer **Q.No.1** and any **three** from the rest

1. Write short notes on any *two* of the following : $2\frac{1}{2} \times 2$

(*i*) Regression line

(*ii*) Purpose of sample survey

(*iii*) Type-I and Type-II error

(*iv*) χ^2- test for goodness of fit.

2. (*a*) Write down the properties of correlation coefficient.

(*b*) Write a 'C-programme' to find out the regression line of y on x for a set of bivariate values (x_i, y_i), $i = 1\,(1), n$.

(*c*) From the following two regression lines find out the mean values and correlation coefficient

$$x + 4y + 3 = 0; \; 4x + 9y + 5 = 0.$$

Hence estimate the value of y when $x = 1{\cdot}5$.

10

3. (*a*) Describe the "Maximum likelihood method" for estimation of a parameter.

(*b*) A sample of 160 off springs of a certain cross between guinea pigs, 102 were found to be red, 24 black and 34 white. According to Genetic model the ratios are (9:3:4). Test at 5% significance level, if the data consistent with the model. $[\chi^2_{0{\cdot}05}(2) = 5{\cdot}99]$.

(*c*) The score of two batsman in the last five innings are :

Batsman - *A*: 5, 100, 110, 7, 17

Batsman - *B*: 40, 45, 75, 50, 29

10

4. (*a*) Define moment generating function. Hence find out the mean for any probability distribution.

(*b*) In an aptitude test, the mean score of 374 girls is 98·7 while the mean score of 255 boys is 95·5. It is shown that for girls s.d. is 14·08 and for boys s.d. is 13·02. Test the significant difference between the mean aptitude score. (Given that for 99% confidence level the normal value is 3·01).

(*c*) Calculate the correlation coefficient from the following frequency table :

y \ x	10 – 20	20 – 30	30 – 40
0 – 10	4	1	3
10 – 20	2	0	5
20 – 30	3	0	1

10

5. (*a*) The height of 10 male students are found to be 70, 67, 62, 52, 61, 68, 70, 64, 65, 66 inches. Is it reasonable to believe that the average height of male students is greater than 64 inches. Test at 5% level of significance.

[Assuming that $P(t > 1{\cdot}83) = 0{\cdot}05$ for 9 d.f.]

(*b*) Write a program in C-language to calculate the median for a set of observations.

(*c*) Briefly describe about skewness. 10

[*Internal Assessment* : 15 Marks]
