(b) Two random samples drawn from two normal populations are :

| Sample I | Sample II |
|---|---|
| 20 | 27 |
| 16 | 33 |
| 26 | 42 |
| 27 | 35 |
| 23 | 32 |
| 22 | 37 |
| 18 | 38 |
| 24. | 28 |
| 25 | 41 |
| 16 | 43 |
| | 30 |
| | 37 |

Obtain the estimates of the variances of the population and test whether the two populations have the same variance.





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Total No. of Questions : 8 ]     [ Total No. of Printed Pages : 4

Roll No. ......................

# MCA – 204

## M. C. A. (Second Semester)
## EXAMINATION, Dec., 2011
### (Grading/Non-Grading)
### COMPUTER ORIENTED NUMERICAL AND STATISTICAL METHODS
### (MCA – 204)

*Time : Three Hours*

*Maximum Marks :* $\begin{cases} GS: 70 \\ NGS: 100 \end{cases}$

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**Note :** Attempt any *five* questions. All questions carry equal marks.

1. (a) Round-off the numbers 965350 and 49·37135 to four significant figures and compute absolute error, relative error and percentage error in each case.

   (b) Determine the number of terms required in the series for log $(1 + x)$ to evaluate log 1·2 correct to six decimal places.

2. (a) From the following table, estimate the number of students who obtained marks between 40 and 45 :

| Marks ($x$) | No. of Students ($y$) |
|---|---|
| 30 – 40 | 31 |
| 40 – 50 | 42 |
| 50 – 60 | 51 |
| 60 – 70 | 35 |
| 70 – 80 | 31 |

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(b) Using Lagrange's interpolation formula to find the value of $y$, when $x = 10$, if the values of $x$ and $y$ are given as below :

| $x$ | $y$ |
|---|---|
| 5 | 12 |
| 6 | 13 |
| 9 | 14 |
| 11 | 16 |

3. (a) Dividing the interval in eight equal parts, use Simpson's $\frac{1}{3}$ rule to evaluate :

$$\int_0^2 \sqrt{\sin x}\, dx$$

(b) Compute the integral $\int_0^3 x^2 \cos x\, dx$, using three points Gaussian quadrature formula for the given numerical values if $u$'s and $w$'s :

$$u_{-1} = -\sqrt{\frac{3}{5}},\ u_0 = 0,\ u_1 = \sqrt{\frac{3}{5}},$$

$$w_{-1} = \frac{5}{9},\ w_0 = \frac{8}{9},\ w_1 = \frac{5}{9}$$



4. (a) Solve by Jacobi's method, the equations :

$$9x - 2y + z = 50$$
$$x + 5y - 3z = 18$$
$$-2x + 2y + 7z = 19$$

(b) Define Ill-conditioned equations and how we can improve accuracy of an ill-conditioned system of equations.

5. (a) Employ Taylor's method to find an approximate value of $y$ when $x = 0{\cdot}2$, for the differential equation $\frac{dy}{dx} = 2y + 3e^x$, $y(0) = 0$, compare the numerical solution obtained with exact solution.







(b) Apply Runge-Kutta method to find an approximate value of $y$ for $x = 0{\cdot}2$ in steps of $0{\cdot}1$, if $\frac{dy}{dx} = x + y^2$, given that $y = 1$, where $x = 0$.

6. (a) Prove that for a $2 \times n$ table :

$$x^2 = \sum \frac{N_1 N_2 \left\{\frac{f_1}{N_1} - \frac{f_2}{N_2}\right\}}{f_1 + f_2}$$

where $f_1, f_2$ are two frequencies in a subgroup and $N_1$ and $N_2$ are the marginal sums of two rows.

(b) In a precision bombing attack there is a 50% chance that any one bomb will strike the target. Two direct hits are required to destroy the target completely. How many bombs must be dropped to give a 99% chance or better of completely destroying the target ?

7. (a) In a certain factory turning calculators, there is a small chance $\frac{1}{500}$ for any calculator to be defective. The calculators are in packets of 10. Use Poisson's distribution to calculate the approximate number of packets containing no defective, one defective and two defective calculators respectively in an assignment of 10000 packets.

(b) Define Gaussian and Uniform distributions.

8. (a) Find $t$ for the following values in a sample of eight :

$$-4, -2, -2, 0, 2, 2, 3, 3$$

taking the mean of the universe to be zero.