**M.C.A. DEGREE EXAMINATIONS: APRIL / MAY 2009**

Fourth Semester

**P07CAE01 NUMERICAL AND STATISTICAL METHODS**

Time: Three Hours                                  Maximum Marks: 100

**Answer ALL the Questions:-**

**PART A (20 x 1 = 20 Marks)**

1. The other name of iterative methods in solution of simultaneous linear equations is
   a) Direct Methods
   b) Indirect Methods
   c) Gauss elimination Methods
   d) Gauss Jordan Methods

2. The method in which we use back substitution process
   a) Gauss Jacobi Method
   b) Gauss Seidel Method
   c) Gauss elimination Methods
   d) Gauss Jordan Methods

3. A method is used to solve a special system of linear equations in which each equations must possess one large co-efficient must be attached to different unknown in that equation.
   a) Gauss Jacobi Methods
   b) Triangularaization Methods
   c) Gauss elimination Methods
   d) Gauss Jordan Methods

4. A method in which solution of simultaneous linear equations is obtained by converting an augmented matrix into an identity matrix
   a) Gauss Jacobi Method
   b) Gauss Seidel Method
   c) Gauss elimination Methods
   d) Gauss Jordan Methods

5. It is convenient to introduce the idea of divided difference interpolation formula when
   a) The values of x are given at equals intervals
   b) The values are x are given at unequal intervals
   c) The function should vary in such a way that it is increasing in the given range with sudden jumps.
   d) The function should vary in such a way that it is decreasing in the given range with sudden jumps.

6. The second order divided difference table value for the following data.

   | X | 2 | 3 | 5 |
   |---|---|---|---|
   | Y | 0 | 14 | 102 |

   a) 74       b) 10       c) 5       d) 75

7. The Simpon's 1/3 rule is derived from the general quadrature formula by putting value for "n" as

   a)     0     b)     1     c)     2     d)     3

8. The Newton's backward difference formula is used.

   a) in the case of unequal interval.
   b) to interpolate the value of Y near $x = x_0$
   c) to interpolate the value of Y near $x = x_n$
   d) to interpolate the value of Y at the midpoint of x values.

9. Multistep method is

   a) Taylor Series
   b) Euler Methods
   c) Runge – Kutta Method
   d) Milne's Predictor Corrector Method

10. Error in Runge – Kutta fourth order method is

    a) $h^4$      b) $h^5$      c) $h^3$      d) $h^2$

11. Given $\dfrac{dy}{dx} = \dfrac{y-x}{y+x}$ with y = 1 & x = 0, then y value at x = 0.1 by Euler's method is

    a) 1.02      b) 1.03      c) 1.01      d) 1.00

12. Solving the initial value problems, the following method do not require the calculati of higher order derivatives.

    a) Taylor Series Method
    b) Euler's Method
    c) Runge – Kutta Method
    d) both (b) & (c)

13. The excepted value of X for the following information is

    | X | 0 | 1 | 2 | 3 | 4 |
    |------|------|-----|-----|-----|------|
    | P(X=x) | 0.05 | 0.2 | 0.5 | 0.2 | 0.05 |

    a) 2.0      b) 0.2      c) 1.0      d) 0.5

14. If a random variable ' X' has the pdf

    $$\begin{cases} f(x) = 2x, & 0 < x < 1 \\ 0 & \text{otherwise} \end{cases}$$

    then P(x < ½) is

    (a) 0.5     (b) 0.25     (c) 0.33     (d) 0.45

15. The mean of the Binomial distribution

    (a) np     (b) npq     (c) $\sqrt{npq}$     (d) $\sqrt{np(1-q)}$

16. $\bar{x} \pm 2\sigma$ covers in the Normal curve

    (a) 84.13%    (b)    97.72%    (c) 99.81%    (d)    100%

17. The type I errors

    (a) Probability of accepting Ho when Ho is true
    (b) Probability of accepting Ho when Ho is false
    (c) Probability of rejecting Ho when it is true
    (d) Probability of rejecting Ho when it is false

18. We use ANOVA for

    (a) one sample
    (b) two sample
    (c) more than one sample
    (d) more than two sample

19    The degrees of freedom for error in one way ANOVA is

    (a)    n-1    (b)    n-2    (c)    n-r    (d)    r-1

20    To test whether or not two population variances are equal, the appropriate distribution is

    (a)    Z    (b)    Chi-Square    (c)    t    (d)    F

## PART B (5 x 16 = 80 Marks)

21. (a)  (i)    Solve the equation

$$-3x + 6y - 11z = 14$$
$$3x - 4y + 6z = -5$$
$$4x - 8y + 13z = -17 \text{ by Gauss elimination method}$$

    (8)

    (ii)    Solve the following system by Gauss Jacobi method,

$$28x + 4y - z = 32;$$
$$x + 3y + 10z = 24$$
$$2x + 17y + 4z = 35$$

    (8)

### (OR)

(b)  (i)    Solve using Gauss Jordan Method

$$2x + 3y + z = -1;$$
$$5x + y + z = 9$$
$$3x + 2y + 4z = 11$$

    (8)

    (ii)    Solve the following equations

$$9x_1 - 2x_2 + x_3 = 17$$
$$4x_1 + 5x_2 - 2x_3 = -9$$
$$x_1 - 3x_2 - 5x_3 = 4 \qquad \text{by Gauss – Seidel method}$$

    (8)

22 (a) (i)     Given the Data

x :     2     5     8     14

y :     94.8     87.9     81.3     68.7

Find the value of x when y = 85

(ii)     Find the first and second derivative of Y at X = 15 for the data given below

X :     15     17     19     21     23     25

Y :     3.873     4.123     4.359     4.583     4.769     5.000

**(OR)**

(b) (i)     Evaluvate     $\int_{0}^{1.2} e^{-x^2} dx$     using

(i) Trapezoidal rule     (ii)     Simpson's $\frac{3}{8}$th rule

(ii)     From the following table values of X and f(x), determine f(0.23) and f(0.29)

| x : | 0.20 | 0.22 | 0.24 | 0.26 | 0.28 | 0.30 |
|---|---|---|---|---|---|---|
| f(x) : | 1.6596 | 1.6698 | 1.6804 | 1.6912 | 1.7024 | 1.7139 |

23 (a) (i)     Solve by Taylor Series method     $y' = xy + y^2$     y(0) = 1   at x = 0.1 and 0.2 correct to four decimal places.

(ii)     Use Runge – Kutta method to find y when x = 1.6 in step of 0.2 given that $\frac{dy}{dx} = x^2 + y^2$ and y(1) = 1.5

**(OR)**

(b) (i)     Compute Y (0.4) by Milne's method, given that     $y' = x + y$, y(0) = 1 with h= 0.1 use Euler's method to find the starting values.

(ii)     Given that $\frac{dy}{dx} = x^2(1 + y)$ , y(1) = 1 , y (1.1) = 1.233, y (1.2) = 1.5485 y(1.3) = 1.9789 find  y(1.4) by Adam's method.

24  (a) (i)     The contents of urns I, II & III are as follows.

1 White, 2 Black, & 3 red balls
2 White, 1 Black, & 1 red balls
4 White, 5 Black, & 3 red balls

One urn is chosen at random and two balls are drawn. They happen to be white and red. What is the probability that they come from urn I, II, and III ?

(ii) Let X be a Binomial random variable with pdf

$$f(x) = \begin{cases} 3\,C_x\,(2/5)^x\,(3/5)^{3-x} & x=0,1,2,\ldots\ldots \\ 0 & \text{otherwise} \end{cases}$$

Find the probability distribution of $y = x^2$ and $y = 2x$ (7)

**(OR)**

(b) (i) The joint pdf of a two - dimensional random variable (X, Y) is given below:-

$$f(x, y) = \begin{cases} 2 & 0<x<1,\ 0<y<x \\ 0, & \text{elsewhere} \end{cases}$$

Find the marginal density function of x & y and condition density function of y given X = x and the cdf of x given Y = y (8)

(ii) Assume that mean height of soldiers to be 68.22 inches with a variable 10.8 inches. How many soldiers in a regiment of 1000 would except to be over 6 feet tall? (8)

25 (a) (i) From the following information state whether the two attributes Condition of house and Condition of child are independent

| Condition of child | Condition of House | |
|---|---|---|
| | Clean | Dirty |
| Clean | 69 | 57 |
| Fairly clean | 81 | 20 |
| Dirty | 35 | 44 |

You can use that 5% value of $x^2$ for 2 degrees of freedom is 5.991 (8)

(ii) Two horses A and B were tested according to the time (in seconds) to run a particular track with following results

| Horse A | 28 | 30 | 32 | 33 | 33 | 29 | 34 |
| Horse B | 29 | 30 | 30 | 24 | 24 | 27 | |

Test whether you can discriminate between two horses. You can use the fact that 5 % value of t –test for 11 degrees of freedom is 2.2. (8)

**(OR)**

(b) The following data represents the number of units of production per day turned out by 5 different workers using 4 different types of machines.

|        |   | A  | B  | C  | D  |
|--------|---|----|----|----|----|
|        | 1 | 44 | 38 | 47 | 36 |
| Workers| 2 | 46 | 40 | 52 | 43 |
|        | 3 | 34 | 36 | 44 | 32 |
|        | 4 | 43 | 38 | 46 | 33 |
|        | 5 | 38 | 42 | 49 | 39 |

(i)     Test whether the mean production is the same for the different machine ty

(ii)    Test whether the workers differ with mean productivity. You can use the
        that F table $_{3,12}$ value is 3.49 & F table $_{4,12}$ value is 3.26.          (16)

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