

MCA (Revised)
Term-End Examination
December, 2021

**MCSE-004 : NUMERICAL AND STATISTICAL
 COMPUTING**

Time : 3 hours

Maximum Marks : 100

Note : *Question no. 1 is compulsory. Attempt any three questions from the rest. Use of calculator is allowed.*

1. (a) What are generated errors ? How are they different from propagated errors ? Show that $a(b - c) \neq ab - ac$, where $a = 0.5555 \times 10^1$; $b = 0.4545 \times 10^1$ and $c = 0.4535 \times 10^1$. 5
- (b) Solve the following system of equations using Gauss elimination method with partial pivoting : 5
- $$X_1 + X_2 + X_3 = 3$$
- $$4X_1 + 3X_2 + 4X_3 = 11$$
- $$9X_1 + 3X_2 + 4X_3 = 16$$
- (c) Determine the missing term 'a' in the following data, using forward differences : 5

x	1	2	3	4	5
f(x)	3	7	a	21	31

(d) If a call centre receives on an average $\lambda = 6$ blank calls per day, what is the probability that it will receive 4 blank calls on any given day ? 5

(e) Calculate the value of the integral $\int_4^{5.2} \log x \, dx$ using Trapezoidal rule. 5
 Take $h = 0.2$.

(f) The tangent of the angle between the lines of regression y on x and x on y is 0.6 , and $\sigma_x = \frac{1}{2}\sigma_y$. Find r_{xy} . 5

(g) Determine the $f(9)$ by applying Lagrange's formula on the following table of data : 5

x	5	7	11	13	17
f(x)	150	392	1452	2366	5202

(h) Obtain the positive root of the equation $x^3 - 5x - 4 = 0$ by using Regula-Falsi method, twice. 5

2. (a) A farmer buys a quantity of cabbage seeds from a company that claims that approximately 90% of the seeds will germinate if planted properly. If four seeds are planted, what is the probability that exactly two will germinate ? 5

(b) Calculate the value of the integral $\int_4^{5.2} \log x \, dx$ using Weddle's rule. 5

(c) Three bags of the same type have the following number of balls :

Bag 1 : 2 black and 1 white

Bag 2 : 1 black and 2 white

Bag 3 : 2 black and 2 white

Randomly one bag is selected and one ball is drawn, it turns out to be white. What is the probability of drawing a white ball again when the first one is not replaced ? 5

(d) Evaluate the integral $I = \int_0^1 \frac{dx}{1+x}$ using Gauss-Legendre three point formula. 5

3. (a) Solve the initial value problem $u' = -2tu^2$ with $u(0) = 1$ and $h = 0.2$ on the interval $[0, 1]$. Use the fourth order classical Runge-Kutta method. 10

(b) Calculate the correlation coefficient for the following heights (in inches) of fathers (X) and their respective sons (Y) :

X :	65	66	67	67	68	69	70	72
Y :	67	68	65	68	72	72	69	71

Obtain the equations of the lines of regression. Also estimate the value of X for $Y = 70$. 10

4. (a) Use Euler's method to find the value of y when $x = 0.1$. Given that $y(0) = 1$ and $y' = x^2 + y$. 7
- (b) A logistics firm has two trucks, which it hires out day-by-day. The number of demands for a truck on each day is distributed as Poisson variate with mean 1.5. Calculate the proportion of days on which
- (i) neither truck is used, and
 - (ii) some demand is refused. 8
- (c) Discuss the following terms with suitable example : 5
- (i) Accuracy
 - (ii) Precision
 - (iii) Relative error
 - (iv) Absolute error
 - (v) Percentage error
5. Write short notes on any **two** of the following : $2 \times 10 = 20$
- (a) Goodness-of-Fit Test
 - (b) Chi-Square Distribution
 - (c) Random Variables and their Types