Total No. of Printed Pages: 2

SUBJECT CODE NO: - YY-2330
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. (CBCGS)(Pattern 2022) S.Y SEM IV
Examination April / May - 2024
Mathematics-XI Numerical Analysis

[Time: 1:30 Hours] **[Max. Marks:40]**

Please check whether you have got the right question paper.

N. B
1) All questions are compulsory.
2) Figures to the right indicates full marks
3) Non programmable calculator is allowed

Q1 Choose correct alternative **10**

1) Relation between the two operators Δ and E is
a) $E \equiv \Delta$ b) $E \equiv 1 + \Delta$ c) $E \equiv 1 - \Delta$ d) $E \equiv \Delta - 1$

2) The first backward difference $\nabla f(x)$ of f(x) when the interval of differencing is h, is defined as
a) $\nabla f(x) = f(x) - f(x+h)$ b) $\nabla f(x) = f(x+h) - f(x)$
c) $\nabla f(x) = f(x) - f(x-h)$ d) $\nabla f(x) = f(x) + f(x-h)$

3) The average operator μ is defined by the operator equation
a) $\mu = \frac{1}{2}\left(E^{\frac{1}{2}} + E^{-\frac{1}{2}}\right)$ b) $\mu = \frac{1}{2}\left(E^{\frac{1}{2}} - E^{-\frac{1}{2}}\right)$
c) $\mu = E^{\frac{1}{2}} + E^{-\frac{1}{2}}$ d) d) $\mu = \frac{1}{4}\left(E^{\frac{1}{2}} + E^{-\frac{1}{2}}\right)$

4) $\Delta^2(e^{ax+b}) =$ ــــ ــ ــ when the interval of differencing is unity
a) e^{ax+b} b) $2e^{ax+b}$ c) e^{ax+b+1} d) $e^{ax+b}(e^a - 1)^2$

5) The first central difference $\delta f(x)$ of the function f(x) when the interval of differencing is h, is defined as
a) $\delta f(x) = f\left(x + \frac{h}{2}\right) + f\left(x - \frac{h}{2}\right)$
b) $\delta f(x) = f\left(x + \frac{h}{2}\right) - f\left(x - \frac{h}{2}\right)$
c) $\delta f(x) = f\left(x + \frac{h}{2}\right)$
d) $\delta f(x) = f\left(x - \frac{h}{2}\right)$

Q2 A) Attempt any one **08**

a) Prove that the n^{th} differences of a rational integral function of the n^{th} degree are constant when the values of the independent variable are at equal intervals.
b) Prove that the divided differences are symmetrical in all their arguments.

B) Attempt any one **07**

c) Use the method of separation of symbols to prove the following identity

$$u_x = u_{x-1} + \Delta u_{x-2} + \Delta^2 u_{x-3} + - - - + \Delta^{n-1} u_{x-n} + \Delta^n u_{x-n}$$

d) Prove that the third divided differences with arguments a, b, c, d of the function $\frac{1}{x}$ is equal to $\frac{-1}{abcd}$

Q3 A) Attempt any one **08**

a) Derive Gauss's interpolation formula for forward differences when the arguments are at equal intervals

b) Explain the method to derive the general quadrature formula for Equidistant ordinates.

B) Attempt any one **07**

c) Assuming Bessel's interpolation formula show that

$$\frac{d}{dx} y_x = \Delta y_{x-\frac{1}{2}} - \frac{1}{24}\Delta^3 y_{x-\frac{3}{2}} + - - -$$

d) Interpolate by means of Gauss's backward formula the population for the year 1936, given the following table

Year	1901	1911	1921	1931	1941	1951
Population (000)	12	15	20	27	39	52