AAM-409

Seat No. _____

B. Sc. (Sem. III) Examination

October / November – 2016

Mathematics : CC MATH-302

(Numerical Analysis)

Time : **3** Hours] [Total Marks : **70**

Instructions : (1) All questions are compulsory.
(2) Figures to the right indicates the mark of the corresponding questions.

1 (a) Discuss Newton-Gregory forward difference interpolation formula for $y = f(x)$. **8**

(b) Attempt any two : **10**

(1) Define factorial polynomial and prove that $\Delta u^{(k)} = k\, u^{(k-1)}$.

(2) Prove that in usual notation

(i) $\Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$

(ii) $E^{1/2} = \mu + \frac{1}{2}\delta$.

(3) From the following table find the value of $f(1975)$ by G-N backward method.

x	1941	1951	1961	1971	1981
$f(x)$	46	67	83	95	102

2 (a) Derive Lagrange's interpolation formula for unequal interval. **8**

OR

(a) Discuss Stirling's central difference interpolation formula for the function $y = f(x)$. **8**

(b) Attempt any two : **10**

(i) Using Gauss backward interpolation formula to find y_{45}, given that

$y_{20} = 512,\ y_{30} = 439,\ y_{40} = 346,\ y_{50} = 243.$

(ii) If $p(x) = 7x^4 - 3x^3 + 2x^2 - x + 11 = 0$ then find the value of $p(-1), p'(-1), p_4''(-1)$ by Synthetic Division.

(iii) If $f(x) = \frac{1}{x^2},\ x \neq 0$ then prove that

$$f(a,b,c) = \frac{ab + bc + ca}{a^2 b^2 c^2}$$

3 (a) Discuss the Picard's method for solving the differential equation $\frac{dy}{dx} = f(x,y)$ with initial condition $y = y_0$ when $x = x_0$ **8**

(b) Attempt any two : **10**

(i) If $f(x) = x^3 - x$, find $f(3,4,5,6)$.

(ii) Prove $Q_{31}(1) = \frac{h}{24}\{-1\ 13\ 13\ -1\}$.

(iii) Evaluate $\int_{20}^{26} x^2\, dx$ by Simpson's 1/3 by rule, using 7 ordinates.

4 Attempt any three : **16**

(i) State and prove Trapezoidal rule.

(ii) Use Picard's method to approximate y when x=0.2 with initial condition $y(0)=1$ for the differential equation

$$\frac{dy}{dx}=x-y.$$

(iii) If $\frac{dy}{dx}=1+xy$ and $y=2$ when $x=0$, using Taylor method. Find y when x=0.4.

(iv) Find $f(5)$ by Lagrange's formula.

x	1	3	4	6	10
$f(x)$	0	18	48	180	900