



GAE-411

Seat No. _____

B. Sc. (Sem. III) Examination

November/December - 2015

CC - MATH-302 : Mathematics : Paper-302
(Numerical Analysis)

Time : 3 Hours]

[Total Marks : 70

Instructions :

- (1) All questions are compulsory.
(2) Figure to the right indicates the marks of the corresponding question.

1 (a) Discuss Newton Gregory forward difference interpolation formula for $y = f(x)$. 08

(b) Attempt any two.

(I) Define factorial polynomial and prove that

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$$x^{[-m]} = \frac{1}{(x+m)^{[m]}} \text{ Where } m \in \mathbb{N}$$

(II) Prove that in usual notation (i) $(E+1)\delta = 2(E-1)\mu$

$$(ii) \mu^2 = 1 + \frac{\delta^2}{4}$$

(III) Evaluate the following (i) $\Delta \tan^{-1} ax$ (ii) $\Delta \frac{x^2}{\cos 2x}$

2 (a) Derive Lagrange's Interpolation formula for unequal interval. 08

OR

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

(b) Attempt any two.

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(I) 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

(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) Prove that $y_m + nC_1 \Delta y_{m-1} + n+1 C_2 \Delta^2 y_{m-2} + \dots = y_{n+m}$.

3 (a) Discuss the Picard's Method for solving the differential equation 08

$$\frac{dy}{dx} = f(x, y), \quad \text{With initial condition } y = y_0 \text{ when } x = x_0.$$

(b) Attempt any two.

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(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.

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(I) State and Prove Trapezoidal Rule.

(II) Discuss the Taylor's Method for solving the differential equation

$$\frac{dy}{dx} = f(x, y), \quad \text{With initial condition } y = y_0, \text{ when } x = x_0.$$

(III) If $\frac{dy}{dx} = 1 + xy$ and $y=2$ when $x=0$, using Picard's 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
