



K19U 0123

Reg. No. :

Name :

VI Semester B.Sc. Degree (CBCSS – Reg./Supple./Improv.)
Examination, April 2019
(2014 Admission Onwards)
CORE COURSE IN MATHEMATICS
6B11MAT – Numerical Methods and Partial Differential Equations

Time : 3 Hours

Max. Marks: 48

SECTION – A

All the 4 questions are **compulsory**. They carry 1 mark each.

1. Give the condition for convergence in the General Iteration method.
2. Complete the expression $\nabla = \dots - E^{-1}$.
3. State Simpson's 1/3 rule of integration.
4. Give the $(n + 1)^{\text{th}}$ approximation step in Picard's method.

SECTION – B

Answer **any 8** questions from among the questions 5 to 14. These questions carry 2 marks each.

5. Find an interval which contains the root of the equation $2x^3 - x^2 + x - 6 = 0$.
6. Find a root of the equation $\log x - \cos x = 0$, where x is in radians, correct to two decimal places, using Regula Falsi Method.
7. Using Lagrange's interpolation formula find the approximate value of $\sin(\pi/6)$.

x	0	$\pi/4$	$\pi/2$
y = sin x	0	0.7071	1

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8. Show that $\Delta \left(\frac{f_i}{g_i} \right) = - \frac{g_i \Delta f_i - f_i \Delta g_i}{g_i g_{i+1}}$.
9. Find the approximate value of $\int_0^{\pi} \sin x dx$ using trapezoidal rule by dividing the range of integration into six equal parts.
10. The acceleration of a missile during its first 40 seconds of flight is given in the following table. Find the velocity of the missile when $t = 40s$.

t(s)	0	10	20	30	40
a(m/s²)	30	31.63	33.34	35.47	37.75

11. Write the formula for Runge Kutta Method of order 2.
12. Given $y' = x - y^2$ and $y(0) = 1$, find $y(0.1)$ using Taylor's series method, correct to two decimal places.
13. Give the Fourier series solution of the one dimensional heat equation, with both ends of the bar kept at temperature 0 and the initial temperature function along the bar is $f(x)$.
14. Solve the equation $u_{yy} = 0$ where u is a function of x and y .

SECTION – C

Answer **any 4** questions from among the questions **15 to 20**. These questions carry **4 marks each**.

15. Find a root of the equation $2x = \cos x + 3$, where x is in radians, correct to two decimal places, using General iteration method.
16. Prove that $\Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$.
17. From the following table find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 3.5$.

x	2	2.5	3	3.5	4
y	12	20.125	32	48.375	70



18. Given the differential equation $\frac{dy}{dx} = \frac{x^2}{y^2 + 1}$, with $y(0) = 0$, use Picard's method to find y when $x = 0.5$.
19. Use modified Euler's method to the equation $\frac{dy}{dt} = t + \sqrt{y}$, $y(0) = 1$ to find $y(0.2)$ using three iterations taking $h = 0.2$.
20. Determine the solution of the heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$, where $u(0, t) = 0$, $u(l, t) = 0$ and $u(x, 0) = x$, l being the length of the bar.

SECTION – D

Answer **any 2** questions from among the questions **21** to **24**. These questions carry **6** marks **each**.

21. a) Use Newton Raphson method to find $(-10)^{1/3}$, correct to two decimal places.
b) Find a real root of $x^3 - 3x - 5 = 0$ using Bisection method.
22. Values of x (in degrees) and $\sin x$ are given in the following table :

x	15	20	25	30	35	40
y = sin x	0.2588	0.3420	0.4226	0.5	0.5736	0.6428

Determine the value of $\sin 38^\circ$ using Newton's backward difference interpolation formula.

23. Use Fourth order Runge-Kutta method to the equation $\frac{dy}{dt} = t + y$, with $y(0) = 1$ to find $y(0.1)$ and $y(0.2)$.
24. Find the solution $u(x, t)$ of the wave equation with initial deflection

$$f(x) = \begin{cases} \frac{2k}{L}x & \text{if } 0 < x < \\ \frac{2k}{L}(L-x) & \text{if } \frac{L}{2} < x < \end{cases}$$

and initial velocity 0.