

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS- 2021

B.Tech-III Semester (Civil)

COURSE CODE: 18B11MA311

MAX. MARKS: 35

COURSE NAME: Numerical Methods

COURSE CREDITS: 03

MAX. TIME: 2 Hours

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Marks are indicated against each question in square brackets.

Q1. Solve the equation $\log_e x = \cos x$ using Newton-Raphson method correct to five decimal places.

[4]

Q2. Solve the system of linear equations correct to three decimal places

$$x_1 + 10x_2 + x_3 = 6, 10x_1 + x_2 + x_3 = 6 \text{ and } x_1 + x_2 + 10x_3 = 6$$

Using Gauss-Seidel method.

[4]

Q3. Given that

$$\sqrt{12500} = 111.803399, \sqrt{12510} = 111.848111,$$

$$\sqrt{12520} = 111.892806, \sqrt{12530} = 111.937483$$

Use Gauss Backward formula to evaluate the value of $\sqrt{12516}$

[4]

Q4. Find the first derivative of the function tabulated below at the point $x = 3.0$

[4]

x	3.0	3.2	3.4	3.6	3.8	4.0
$f(x)$	-14	-10.032	-5.296	0.256	6.672	14

Q5.(a) Compute the value of the integral $\int_{0.2}^{1.4} (\sin x - \log_e x + e^x) dx$ using Simpson's 3/8 rule correct to four decimal places. Take $h = 0.1$

[4]

(b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$

Correct to four decimal places using Simpson's 1/3 rule and compare it with the exact result.

Take $h = \frac{1}{6}$

[4]

Q6. Using Runge-Kutta method of fourth order, solve the given differential equation for $x = 0.2$ and 0.4 and take $h = 0.2$

$$\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2} \text{ with the condition } y(0) = 1$$

Fix your calculator to 4 decimal places.

[6]

Q7. Solve the heat equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, up to second level ($J=2$), subjected to initial and boundary conditions $u(x, 0) = 0$, $u(0, t) = 0$ and $u(1, t) = t$ using Crank – Nicolson method.

Take $k = \frac{1}{16}$ and $h = \frac{1}{4}$. Fix your calculator at four decimal places.

[5]