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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
SUMMER SEMESTER – END TERM TEST (JULY 2016)

COURSE CODE: 10B11MA312

MAX. MARKS: 50

COURSE NAME: NUMERICAL METHODS

COURSE CREDITS: 4

MAX. TIME: 2 HRS

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Use of Scientific Calculator is allowed. Attempt the questions section wise in a sequence. Marks are indicated against the questions.

1. Explain and derive the Romberg's Method with trapezoidal formula. Using the method compute

$$\int_0^1 \frac{dx}{1+x^2} \text{ correct to 3 decimal places.} \quad (10)$$

2. Apply Simpson's rule to evaluate the integral $I = \int_{y=2}^{2.6} \int_{x=4}^{4.4} \frac{dx}{xy}$. (5)

3. Use Picard's method of successive approximation to find the value of y when $x = 0.1$, given that

$$y = 1 \text{ when } x = 0 \text{ and } \frac{dy}{dx} = 3x + y^2. \quad [\text{Find in upto 2 steps only}] \quad (5)$$

4. Explain the methodology of Cubic Spline with derivation and fit a natural cubic spline passing through $(1, -6), (2, -1), (3, 16)$. Hence evaluate $y(1.5)$. (10)

5. Using derivatives based on Stirling formula, find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for $x = 0.2$ for the data given in the following table : (7)

x	0	0.1	0.2	0.3	0.4	0.5
y	0	0.15	0.23	0.34	0.41	0.52

6. Determine the equation to the best fitting exponential curve of the form $y = ae^{bx}$ for the data given in the table: (7)

x	1	3	5	7	9
y	115	105	95	85	80

7. Use Runge Kutta Method of order four and with $h = 0.1$ to find an approximate solution of (6)

$$\frac{dy}{dx} = x^2 + y \text{ at } x = 0.1, 0.2.$$
