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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-3 EXAMINATION- December 2018

B. Tech. III Semester (CE)

COURSE CODE: 10B11MA312 MAX. MARKS: 35

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.*

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1. Perform four iterations of the Newton-Raphson method to find a root of $e^x - 4x = 0$. Take the initial approximation as $x_0 = 2$. [5 Marks], [CO1]

2. The population data of a town is given below. Using Newton's forward and backward interpolation formula for derivatives compute the growth rate of the population in 1941 and 1961. [6 Marks], [CO5]

Year: x_i	1931	1941	1951	1961	1971
Population: $f(x_i)$	40.620	60.800	79.930	103.560	132.650

3. The following table gives the variation in the specific weight of ocean water with depth.

Depth (m): x_i	0	100	200	300	400	500	600
Specific weight (kPa/m): $\gamma(x_i)$	10.055	10.059	10.063	10.068	10.072	10.076	10.079

Compute the hydrostatic pressure at depth 600 m using trapezoidal rule, Simpson's 1/3 rule, and Simpson's 3/8 rule. Assume that the hydrostatic pressure at depth d is given by $\int_0^d \gamma(x)dx$, where $\gamma(x)$ denotes the specific weight at depth x. [6 Marks], [CO5]

4. Using Taylor series method solve the IVP $y' = 2y + 3e^x,\ y(0) = 0$. Hence evaluate $y(0.1)$ and $y(0.2)$. [6 Marks], [CO6]

5. Perform three iterations of the Picard's method to solve the IVP $y' = y - x^2,\ y(0) = 1$. Hence evaluate $y(0.1)$ and $y(0.2)$. [6 Marks], [CO6]

6. Using fourth order Runge-Kutta method, compute $y(0.2)$, from the IVP

$$10y' = x^2 + y^2,\ y(0) = 1$$

Take step size $h = 0.1$. [6 Marks], [CO6]

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