SIMP Problem types for Mathemetics- 4

Disclaimer: These questions are picked by the TIE review team teachers/mentors by referring to more than 15 previous years question papersand Internal question papers from more than 10 colleges. The sole purpose of this is to give a thorough idea about the type of Questions in the final assessment paper(sem-end exams).We kindly request the students to practice problems of these types(min 3-4 questions per question type) and other types as well for the best results.

Super Important Problem Types for Module-4

Type 1: Finding root by Regula falsi method(Correct to 4 decimal places) - Practice 2-4 more problems

a. $xe^x = 2$ **b.** $x\,log_{10}x = 1.2$ **c.** $x\,e^x = \cos x$

Type 2: Finding root by Newton Raphson method(Correct to 4 decimal places) -Practice 2-4 more problems

a. $tanx - x = 0$ (near $x = 4.5$) **b.** $xe^x = 2$ **c.** $xsinx + cosx = 0$ near the point

d. $3x - 1 = \cos x$

Type 3: Newton's forward and Backward interpolation- Practice 2-4 more problems

a. The population of a town given by the table

Year	1951	1961	1971	1981	1991
Population in thousands	19.96	39.65	58.81	77.21	94.61

Using Newton's forward and backward interpolation formula, calculate the increase in population from the year 1955 to 1985

b. From the following table estimate the number of students who obtained marks between 40 and 45:

Marks	$30-40$	$40-50$	$50-60$	$60-70$	$70-80$
No. of students	31	42	51	35	31

c. Given $\sin 45° = 0.7071, \sin 50° = 0.7660, \sin 55° = 0.8192, \sin 60° = 0.8660,$ find $\sin 57°$ using anappropriate interpolation formula.

d. Using suitable interpolation formula find $y(82)$ and $y(98)$ for the following data:

x	80	85	90	95	100
y	5026	5674	6362	7088	7854

Type 4: Newton's divided difference interpolation- Practice 2-4 more problems

a. Construct the interpolation polynomial for the data given below using Newton's divided difference formula:

x	2	4	5	6	8	10
y	10	96	196	350	868	1746

b. Fit interpolating polynomial for $f(x)$ using Newton's divided difference interpolation formula. Given $f(0) = -5, f(1) = -14, f(4) = -125, f(8) = -21, f(10) = 355$. Hence evaluate $f(2)$

c. Using Newton's divided difference formula evaluate $f(8)$ and $f(15)$ given:

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

Type 5: Lagrange's interpolation- Practice 2-4 more problems

1. The observed values of a function are respectively 168, 120, 72 and 63 at the four positions 3, 7, 9, 10 of the independent variable. What is the best estimate you can give for the value of the function at the position 6 of the independent variable? Use Lagrange's method.

2. Use Lagrange's interpolation formula to find the interpolating polynomial that approximate the function described by the following table. Hence find $f(4)$.

x	0	1	2	5
y	2	3	12	147

3.Use Lagrange's interpolation formula to fit a polynomial for the data, Hence estimate y at $x = 2$

x	0	1	3	4
$f(x)$	-12	0	6	12

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Type 6: Numerical integration- Practice 2-4 more problems

1. Using Simpson's 1/3rd rule, evaluate $\int_0^{\pi/2} \sqrt{cos\theta} d\theta$ by dividing the interval into eight equal parts.
2. Using Simpson's1/3rd rule find $\int^{0.6 \text{ to } 0} e^{-x^2}\, dx$ by taking 7 ordinates.
3. Compute the value of $\int^{1.4 \text{ to } 0.2} (\sin x - \log x + e^x)\, dx$ using Simpson's rule taking 6 parts. Hence deduce anapproximate value of π.
4. Using Simpson's 3/8 rule evaluate $\int^{4 \text{ to } 0} e^{1/x} dx$ taking equidistant ordinates

Super Important Problem Types for Module-5

1. Employ Taylor's series method to find y at $x = 0.1$ correct to four decimal places for the initial value problem dy/dx= $(x - y^2)$,y(0)=1
2. Use Taylor's series method to find $y(0.1)$, correct to five decimal places if $y(x)$ satisfies the equation dy/dx= $dy/dx = \frac{\sqrt{x^2+y}}{1}$ with y(0) = 0.8
3. Applying Milne's Predictor-Corrector method, find y(0.8), from $dy/dx=x^3+y$, given y(0) = 2, y(0.2) = 2.073 , y(0.4)=2.452 y(0.6)=3.023
4. The following table gives the solution of $5xy' + y^2 - 2 = 0$. Find the value of y at $x = 4.5$ using Milne's predictor corrector method

x	4	4.1	4.2	4.3	4.4
y	1	1.0049	1.0097	1.0143	1.0187

5. Using the Runge-Kutta method of order 4, find y at x = 0.1, given that $dy/dx=3e^x+2y$, y(0) = 1
6. Find y at $x = 0.4$ given $y' + y + xy^2 = 0$ and $y0 = 1$, $y_1 = 0.9008$, $y_2 = 0.8066$, $y_3 = 0.722$ taking $h = 0.1$ using Adams-Bashforth method. Apply corrector formula twice.
7. Applying Milne's Predictor-Corrector method, find y(1.4), from $dy/dx= x^2+y/2$, given y(1) = 2, y(1.1) = 2.2156 , y(1.2)=2.4549 y(1.3)=2.7514
8. Using Adams predictor-corrector method, obtain the solution of dy/dx = xy/2 at x=0.4, given the values

x	0	0.1	0.2	0.3
y	1	1.0025	1.0101	1.0228

9. Use Taylor's series method to find the value of y at $x = 0.1$, given

   dy/dx= $x^2 y$ -1, $y(0)=1$ considering upto 4^{th} degree terms
10. Use modified Euler's method to solve dy/dx= x+|√y| at $x = 0.2$ by taking $h = 0.2$ given that $y(0) = 1$.
11. Using modified Euler's method find y at $x = 0.1$, given dy/dx= 3x+y/2, y(0)=1, h=0.1,Perform 2 iterations

Note: Make sure to practice 3-5 more problems per problem type for better results