King Fahd University of Petroleum and Minerals
Information Technology Center
Computing Services Section

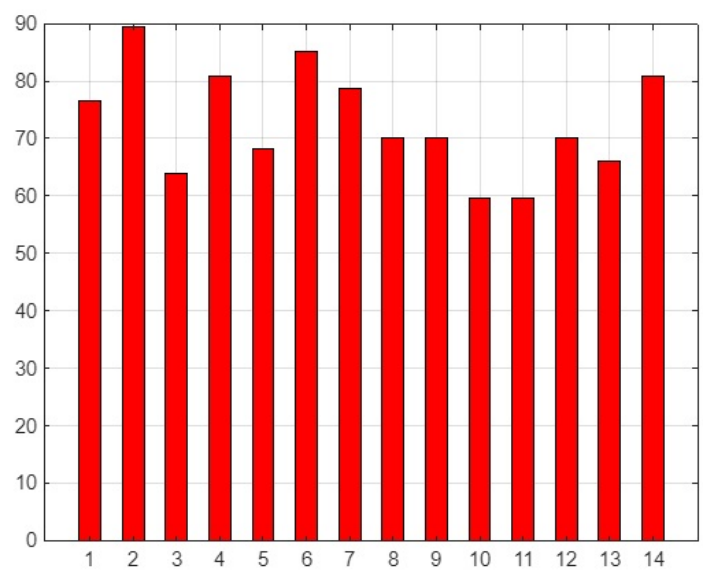
Dept. of: Math
Course: math371 Second Major Exam
Semseter: 242

Tuesday, April 15, 2025

			Raw Score	% Score
Total no. of Students: 47		**Course Mean:**	50.96	72.8
Course Std. Dev. : 13.9		**Max. Score:**	70	100
		Min. Score:	15	21.43

Average (%) of each question

Q1	76.5957
Q2	89.3617
Q3	63.8298
Q4	80.8511
Q5	68.0851
Q6	85.1064
Q7	78.7234
Q8	70.2128
Q9	70.2128
Q10	59.5745
Q11	59.5745
Q12	70.2128
Q13	65.9574
Q14	80.8511



Question with highest average
Q2

Question with lowest average
Q10 Q11

1. Which one of the following functions does **not** satisfy a Lipschitz condition on the domain D?

(a) $f(t,y) = \sqrt{y-1} + \sin 3t$ on $D = \{(t,y)|1 \le t \le 2,\ 0 \le y \le 2\}$ ________(correct)

(b) $f(t,y) = (t^2+1)y$ on $D = \{(t,y)|0 \le t1,\ -1 \le y \le 1\}$

(c) $f(t,y) = te^{2y} + ty$ on $D = \{(t,y)|1 \le t \le 2,\ 1 \le y \le 2\}$

(d) $f(t,y) = \sqrt{y-1} + t^2$ on $D = \{(t,y)|2 \le t \le 3,\ 2 \le y \le 3\}$

(e) $f(t,y) = 1 + \cos ty$ on $D = \{(t,y)|0 \le t \le 2,\ -1 \le y \le 1\}$

no students = 47
Average = 76.5957 %

2. If the Euler's method is used to approximate the solution for the initial-value problem

$$y' = -y + ty^{\frac{1}{2}}, 3 \le t \le 4,\ y(3) = 2,$$

with $h = 0.1$, and knowing that $w(t_8) = 4.2509$, then $y(4) \approx$

(a) 4.9856 ________(correct)

(b) 4.7120

(c) 4.2931

(d) 4.8956

(e) 4.7865

no students = 54
Average = 89.3617 %

3. If the Euler's method is used to approximate the solution for the initial-value problem

$$y' = \frac{2-2ty}{t^2+1},\ 0 \le t \ge 1,\ y(0) = 1$$

with exact solution $y(t) = \dfrac{2t+1}{t^2+1}$, $h = 0.2$, then the smallest bound error at $t = 0.6$ is
(where $|y''(t)| \le 2.3416$)

(a) 0.1925 ———————————————— (correct)
(b) 0.2125
(c) 0.1625
(d) 0.1726
(e) 0.1825

no students = 47
Average = 63.8298 %

4. Use the Ranga-Kutta method of order four to approximate the solution of initial-value problem

$$y' = -y + ty^{\frac{1}{2}},\ 3 \le t \le 4,\ y(3) = 2$$

with $n = 10$, then $w_1 =$

(a) 2.2321 ———————————————— (correct)
(b) 2.4321
(c) 2.3321
(d) 2.5321
(e) 3.2321

no students = 54
Average = 80.8511 %

5. Using the Mid point method to approximate the solution of initial value problem

$$y' = -y + ty^{\frac{1}{2}},\ 3 \le t \le 4,\ y(3) = 2$$

with $n = 10$, then $w_2 =$

(a) 2.4799 ________________________________ (correct)

(b) 2.5799

(c) 2.4199

(d) 2.4299

(e) 2.9799

no students = 47
Average = 68.0851%

6. Using Gaussian elimination with partial pivoting and two-digit chopping arithmetic to solve

$$\sqrt{2}x + \sqrt{3}y = \pi$$
$$\sqrt{7}x + y = 1$$

then $y =$

(a) 2.2 ________________________________ (correct)

(b) 2.1

(c) 2.0

(d) 2.3

(e) 1.9

no students = 47
Average = 85.1064 %

7. If Gaussian elimination is used to solve the system

$$\begin{aligned} 2x_1 - 1.5x_2 + 3x_3 &= 1 \\ -x_1 \qquad\quad + 2x_3 &= 3 \\ 4x_1 - 4.5x_2 + 5x_3 &= 1, \end{aligned}$$

then $x_2 =$

(a) 0 ____(correct)

(b) -1

(c) 1

(d) 0.5

(e) 0.2

no students = 47
Average = 78.7234 %

8. If the matrix $\begin{bmatrix} 2 & 0 & -1 \\ -6 & 1 & 2 \\ 4 & 3 & 3 \end{bmatrix}$ is expressed in LU form,

where $L = \begin{bmatrix} 1 & 0 & 0 \\ l_1 & 1 & 0 \\ l_2 & l_3 & 1 \end{bmatrix}$ and $U = \begin{bmatrix} a & b & c \\ 0 & d & e \\ 0 & 0 & f \end{bmatrix}$, then $l_2 + f =$

(a) 10 ____(correct)

(b) 9

(c) 11

(d) 12

(e) 13

no students = 47
Average = 70.2128 %

9. If $A = \begin{bmatrix} a & 1 & 0 \\ b & 2 & 3 \\ c & 0 & 1 \end{bmatrix}$ and the permutation matrix $P = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$, then $PA =$

(a) $\begin{bmatrix} c & 0 & 1 \\ b & 2 & 3 \\ a & 1 & 0 \end{bmatrix}$ ________________ (correct)

(b) $\begin{bmatrix} 1 & a & 0 \\ 2 & b & 3 \\ 0 & c & 1 \end{bmatrix}$

no students = 47
Average = 70.2128 %

(c) $\begin{bmatrix} a & 1 & 0 \\ c & 0 & 1 \\ b & 2 & 3 \end{bmatrix}$

(d) A

(e) $2A$

10. If the system

$$\frac{1}{2}x + \frac{1}{3}y = \frac{1}{63}$$
$$\frac{1}{3}x + \frac{1}{4}y = \frac{1}{168}$$

has the actual solution $\left(\frac{1}{7}, \frac{-1}{6}\right)^t$ and an approximation solution $\bar{X} = (0.14, -1.6)^t$, then $\| A\bar{X} - b \|_\infty \approx$

(a) 0.4792 ________________ (correct)

(b) -0.3680

(c) 0.3680

no students = 47
Average = 59.5745 %

(d) -0.4792

(e) 1

11. If $A = \begin{bmatrix} \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 1 \\ 2 & -3 & 0 \\ 2 & -1 & -1 \end{bmatrix}$, then $\| A \|_\infty =$

(a) 5 ________________________________ (correct)

(b) 1

(c) 4

(d) 0

(e) 6

no students = 47
Average = 59.5745 %

12. If $A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, then $\| A \|_2 =$

(a) 3 ________________________________ (correct)

(b) 1

(c) 4

(d) 9

(e) 18

no students = 47
Average = 70.2128 %

13. Let $X^{(0)} = (0,0,0)^t$. If the second iteration of Gauss-Seidel Method for the system

$$\begin{aligned} 2x_1 - x_2 + x_3 &= -1 \\ 2x_1 + 2x_2 + 2x_3 &= 4 \\ -x_1 - x_2 + 2x_3 &= -5 \end{aligned}$$

is $(x_1^{(2)}, x_2^{(2)}, x_3^{(2)})$, then $x_2^{(2)}$

(a) 2 ______ (correct)

(b) $-\frac{1}{2}$

(c) $\frac{3}{2}$

(d) $-\frac{3}{2}$

(e) $\frac{5}{2}$

no students = 47
Average = 65.9574 %

14. If the following system is solved using the Cojugate Gradient method and $C = C^{-1} = I$ with $x^{(0)} = (0,0)^t$.

$$\begin{aligned} 5x_1 + x_2 &= 3 \\ x_1 + 8x_2 &= 2 \end{aligned}$$

(Use four-digit rounding)

(a) $(0.5641,\ 0.1795)^t$ ______ (correct)

(b) $(0.6541,\ 0.1795)^t$

(c) $(0.541,\ 0.1595)^t$

(d) $(0.7541,\ 0.16795)^t$

(e) $(0,0)$

no students = 47
Average = 80.8511 %

Q	MASTER	CODE01	CODE02	CODE03	CODE04
1	A	C 5	E 10	E 14	E 6
2	A	B 12	D 11	C 13	E 9
3	A	E 3	E 6	C 6	C 13
4	A	A 8	D 12	D 5	C 1
5	A	A 1	E 13	D 3	D 8
6	A	E 10	D 8	C 4	D 2
7	A	A 14	B 5	A 8	A 12
8	A	A 7	C 1	C 2	E 14
9	A	A 11	B 3	C 11	C 5
10	A	D 9	B 4	A 9	E 11
11	A	A 4	C 9	C 12	E 10
12	A	B 6	C 7	B 1	A 4
13	A	D 13	E 2	B 7	B 3
14	A	C 2	D 14	A 10	B 7

Answer Counts

V	A	B	C	D	E
1	6	2	2	2	2
2	0	3	3	4	4
3	3	2	6	2	1
4	2	2	3	2	5