Jordan University of Science and Technology,
Department of Electrical Engineering
EE305- Second Exam

Name: 1st semester 2011

Instructor: د. مأمون المستكي *Section:* 2:15 ~ 3:15

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	B	C	D	D	A	C	D	C	B	D	B	D	A	B	C

Q1) If the three data points (0,1), (1,2) and (2,8) are best fit to $e^{\beta x}$ the value of β is:
A) 0.3567 B) 0.6931 C) 0.9704 D) 0.4951

Q2) Given the following two pieces of quadratic splines that sandwich a knot at x=1 as $s_{k+1}(x) = 1.5x^2 + bx + 5$ $s_k(x) = x^2 + 2x + a$, then the values of a and b, respectively are: A) (1.5 ,2.5) B) (4.5,1) C) (3,0) D) (6,4)

Q3) The element ℓ_{32} of the lower triangular matrix [L] in the [L][U] decomposition of the matrix $\begin{bmatrix} 25 & 5 & 4 \\ 5 & 9 & 16 \\ 5 & 5 & 22 \end{bmatrix}$ is: A) 1.73 B) zero C) 0.5 D) 1.5

Q4) Consider the linear system:

$2y+3z=1, 2x+5y+2z=-2, 3x+y+z=3$

Starting with initial guess $[0,0,0]^T$ the value of x, y and z after two iterations using converging Gauss-Seidel iteration is:

A) [1.000, -0.800, 0.867]
B)[1.022, -0.307, 0.600]
C) [1.000, -0.400, 0.333]
D) [0.978, -1.138, 1.092]

For the data given below answer the following two questions:

x_i	0	1	2	3
y_i	-1	2	2	3

Q5) The intercept with y-axis of the straight line that best fit the data equals:

A) -1.1 B) -0.6 C) -0.3 D) 1.1

Q6) The coefficient of determination for the fitting in the previous problem equals:

A) 0.9500 B) 0.6889 C) 0.9222 D) 0.8000

Q7) The degree of the polynomial that passes through $n+1$ data points equals:

B) $n+1$ B) n C) n or less D) $n+1$ or less

Q8) The table below shows the velocity versus time:

Time(s)	0	15	18	22	24
Velocity (m/s)	22	25	*a*	25	123

The velocity at t=16 seconds was estimated to be 30.429 m/s using quadratic interpolating polynomial. The value of ***a*** is most nearly to:

A) 35 m/s B)36 m/s C)37 m/s D)35.5 m/s

Q9) The interpolation polynomial $p(x)$ of degree 3 passes through the points (1, 1), (2, -1), (0,0) and (3, 2) (using the divided difference method) is:

A) $\frac{3}{2}x^3-6x^2+\frac{11}{2}x+1$ B) $\frac{7}{6}x^3-5x^2-1$ C) $\frac{4}{3}x^3-\frac{11}{2}x^2+\frac{31}{6}x$ D) $\frac{7}{3}x^3-\frac{17}{2}x^2+\frac{43}{6}x$

Q10) If the data given below

Xi	1	2	3
Yi	1.5	2.5	2

are fitted to $f(x)=\sqrt{1+ax^b}$, then the values of a and b respectively are:

A) 1.224 and -1.140 B) 1.546 and 0.934 C) 3.77 and 0.065 D) 0.572 and 0.114

Q11) What is $f(x_0)$ given that

$x_0=0, x_1=0.4, x_2=0.7, f(x_2)=4, f[x_2,x_1]=10, f[x_2,x_1,x_0]=\frac{50}{7}$

A)1 B)3 C)1.5 D)-1

Q12) For the following system of equations $x^2+y^2=4$, $e^x+y=1$
The value of x from the first iteration using Newton-Raphson method with initial guesses $x_o = y_o = 1$ is:

A)-1.163953 B)3.335387 C)1.337769 D)-3.245681

Q13) A robot needs to follow a path that passes consecutively through six points. The shortest smooth path is obtained by:

A) a fifth order polynomial through the data B) linear splines through the data
C) quadratic splines through the data D) a third order polynomial regression

Q14) The following data of the velocity of a body is given as a function of time.

Time (s)	0	15	18	22	24
Velocity (m/s)	12	21	36	28	123

Use 2nd order Lagrange interpolating polynomial to find the best value of the velocity at 16 seconds

A)27 B)28 C) 29 D)30

Q15) In order to interpolate n-data points using k-order spline, the number of continuity (value and derivatives) conditions one should satisfy equals:

A) k(n-2) B) n(k-1) C) (n-1)(k-2) D) nk

Q16) Given the linear system: $2x_1 + x_2 = 3,\ x_1 + ax_2 = b$. What values of ***a*** and ***b*** that make the system with no solution:

A) a=2/3 and b=1 B) a≠1/2 and b=2/3 C) a=1/2 and b≠2/3 D)None

$$J=\begin{bmatrix} \frac{\partial f_1}{\partial x_1} & \frac{\partial f_1}{\partial x_2} \\ \frac{\partial f_2}{\partial x_1} & \frac{\partial f_2}{\partial x_2} \end{bmatrix},\quad \begin{bmatrix} n & \sum x \\ \sum x & \sum x^2 \end{bmatrix}\begin{pmatrix} a_0 \\ a_1 \end{pmatrix}=\begin{pmatrix} \sum y \\ \sum xy \end{pmatrix},\quad r^2=\frac{S_t-S_r}{S_t}=\frac{\sum (y-\bar{y})^2-\sum (y-y_{model})^2}{\sum (y-\bar{y})^2},$$

$$f[x_2,x_1,x_0]=\frac{f[x_2,x_1]-f[x_1,x_0]}{x_2-x_0},\quad P_n(x)=\sum_{k=0}^{n} f(x_k)L_k(x),,,L_k(x)=\prod_{\substack{j=0 \\ j\neq k}}^{n}\left(\frac{x-x_j}{x_k-x_j}\right)$$