Sanjay Ghodawat University, Kolhapur

2018-19

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Year and Program:2018-19	**School of Technology**
S.Y.B.Tech	

Department: Aeronautical

Course Code: AET 202 **Course Title:** **Semester – IV**
Applied Numerical Methods

Day and Date: **End Semester Examination** **Time:** 10:30AM to 1:30pm

Tuesday, 21st may 2019 **(ESE)** **Max Marks: 100**

Instructions:
1) All questions are compulsory.
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks.
4) Use of non-programmable calculator is allowed.

Q.1

		Marks	Bloom's Level	CO

a) Use secant method to determine the root of the equation $x \log_{10} x = 1.2$ correct up to four decimal places. | 07 | L_2 | CO1

OR

a) Find the positive roots of the equation $x^3 - 2x - 5 = 0$ by the method of false position correct to three decimal places. | 07 | L_2 | CO1

b) Apply Gauss-Jordon method to solve the equations | 08 | L_1 | CO2

$$x + y + z = 5; \quad 2x + 3y + z = 10; \quad 3x - 2y + 2z = 3$$

OR

b) Solve the following equations by Jacobi's iteration method | 08 | L_1 | CO2

$$20x + y - 2z = 17; \quad 3x + 20y - z = -18; \quad 2x - 3y + 20z = 25$$

Q.2

a) Find the distance moved by a particle and its acceleration at the end of 4 second, if the time (t) verses velocity (u) data is follows. | 07 | L_3 | CO3

t	0	1	3	4
u	21	15	12	10

OR

a) From the following table find y at x=2.4 by using Newton's Interpolation formula | 07 | L_3 | CO3

x	1.7	1.8	1.9	2.0	2.1	2.2	2.3
f(x)	5.474	6.050	6.686	7.389	8.166	9.025	9.974

b) A sample of 100 dry battery cells tested to find the length of life produced the following results mean 12 hours and Standard deviation 3 hours. Assuming the data to be normally distributed, what percentage of battery cells are expected to have life

i) more than 15 hours.

ii) less than 6 hours.

iii) between 10 to 14 hours.

08 L₃ CO4

<div align="center">OR</div>

b) A random variable X has the following probability distribution

08 L₃ CO4

X	0	1	2	3	4	5	6	7
P(X)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

i) Find k

ii) Evaluate P(X<6), P(X≥6) and P(3<X≤6)

iii) Find the minimum value of x so that $P(X \le x) > \dfrac{1}{2}$.

Q.3 **Solve any Two**

a) Find the real root of equation using Bisection method up to two decimal places $x e^x - \cos x = 0$.

08 L₁ CO1

b) Solve the following equations by using LU decomposition method.
$$10x + y + 2z = 13; \quad 3x + 10y + z = 14; \quad 2x + 3y + 10z = 15$$

08 L₃ CO2

c) Using Newton's divided differences formula, evaluate $f(8)$ and $f(15)$ for the following data

08 L₃ CO3

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

d) From a box containing 100 transistors 20 of which are defective, 10 are selected at random, find the probability that

i) all will be defective

ii) all are non defective

iii) at least one is defective.

08 L₄ CO4

Q.4　　**Solve any Three.**

a)　Find the first derivative at $x = 3$ from the following data　　06　L$_2$　CO5

x	0	10	20	30	40
y	19.96	39.65	58.81	77.21	94.61

b)　Find the first and second derivatives at $x = 0.5$ from the following data　　06　L$_2$　CO5

x	0.35	0.40	0.45	0.50	0.55	0.60	0.65
y	1.521	1.506	1.488	1.467	1.444	1.418	1.389

c)　Calculate $f'(9)$ from the following table　　06　L$_2$　CO5

x	5	7	11	13	17
y	150	392	1452	2366	5202

d)　Evaluate $\int_0^1 \dfrac{dx}{1+x}$, by dividing the interval of integration into 8 equal parts. Hence find $\log_e 2$ approximately.　　06　L$_2$　CO5

Q.5　　**Solve any Two.**

a)　Solve $\dfrac{dy}{dx} = x - y^2$ with $x_0 = 0$, $y_0 = 1$ by Euler's modified method for $x = 0.1$ by taking $h = 0.05$　　09　L$_3$　CO6

b)　Solve $\dfrac{dy}{dx} = \dfrac{y^2 - x^2}{y^2 + x^2}$; $y(0) = 1$ at $x = 0.2$ and $x = 0.4$, by using Runge-kutta fourth order method.　　09　L$_3$　CO6

c)　Obtain y as power series of x, for the differential equation $\dfrac{dy}{dx} = 2x - y$ with initial conditions $x_0 = 0$, $y_0 = 0$ by Taylor's method and find the approximate value of y for $x = 0.2$ and $x = 0.4$. Compare your results with exact values.　　09　L$_3$　CO6

Q.6   **Solve any Three**

a)   A train is moving at a speed of 30 m/sec. suddenly brakes are   06   L₄   CO5
applied. The speed of the train per second after 't' seconds is given
by

Time(t)	0	5	10	15	20	25	30	35	40	45
Speed(v)	30	24	19	16	13	11	10	8	7	5

Apply Simpson's three-eighth rule to determine the distance moved
by a train in 45 seconds.

b)   Use Romberg's method to compute $\int\limits_{0}^{1} \dfrac{dx}{1+x^2}$ correct to four decimal   06   L₂   CO5

places.

c)   Using Euler's method, find the approximate value of y at $x = 1$ in 5   06   L₁   CO6
steps, given that $\dfrac{dy}{dx} = x + y$ and $y(0) = 1$.

d)   Using Picard's method, solve $\dfrac{dy}{dx} = -xy$ with $x_0 = 0$, $y_0 = 1$ upto   06   L₂   CO6

third approximation and find $y(0.2)$.

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