BACHELOR OF ENGG. INFORMATION TECHNOLOGY EXAMINATION - 2018
(2nd Year; 2nd Semester)
Numerical Methods and Optimization Techniques

Time : Three hours **Full Marks: 100**

CO1 [20]

1. Answer any Two of (a), (b) and (c).

(a) (i) Compute sqrt(37) using Newton-Raphson method. (6)

(ii)Suggest an approach to avoid "root-jumping" limitation in Newton-Raphson method. (4)

(b) (i) A calculator is defective: it can only add, subtract, and multiply. Use the equation 1/x = 1.37, the Newton Method, and the defective calculator to find 1/1.37 correct to 8 decimal places. (6)

(ii) Which method you will suggest to find the roots of equation x^2 =0. Why? (4)

(c) The upward velocity of a rocket is given as a function of time in the following Table

t(s)	v(t) (m/s)
0	0
10	227.04
15	362.78
20	517.35
22.5	602.97

Find the velocity of the rocket at t = 16s. (10)

CO2 [20]

2.

(a) (i) Find the acceleration of the rocket at t = 16s in problem 1 (c). (4)

(ii) Given

$$3\frac{dy}{dx} + 5y^2 = \sin x, y(0.3) = 5$$

and using a step size of $h = 0.3$, find the value of $y(0.9)$ using Euler's method. (6)

(b) Derive the value of $\int_{0.2}^{2.2} xe^x dx$ by using the one-segment trapezoidal and the 2-segment Simpson's 1/3 rule. (5+5)

CO3 [20]

3.

(a) Use Gaussian elimination to solve the system of linear equations

$$2x2 + x3 = -8$$
$$x1 - 2x2 - 3x3 = 0$$
$$-x1 + x2 + 2x3 = 3.$$ (15)

(b) How many solution(s) the following system of equations has? Give reasons (without solving the equations). (5)

$$x - y = 2$$
$$6x + 6y = 12$$

CO4 [20]

4. Answer any Two of (a), (b) and (c).

(a) Suppose a manufacturer of printed circuits has a stock of 200 resistors, 120 transistors and 150 capacitors and is required to produce two types of circuits. Type A requires 20 resistors, 10 transistors and 10 capacitors. Type B requires 10 resistors, 20 transistors and 30 capacitors. If the profit on type A circuits is £5 and that on type B circuits is £12, how many of each circuit should be produced in order to maximize the profit? Use Graphical method to solve. (10)

(b) Use the simplex method to solve the linear programming problem. (10)

Maximize $P = x + 2y$

subject to.

$x + 4y \leq 20$

$5x + y \leq 32$

$x + y \leq 8$

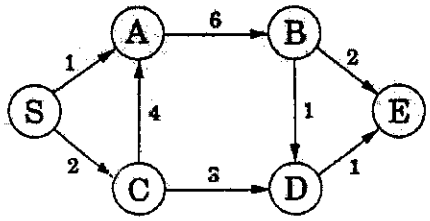
$x \geq 0$

$y \geq 0$

(c) Derive the dual of the LP problem in 8. (10)

CO5 [20]

5. Consider following graph. The number associated with each edge is the weight of that edge. Formulate the LP for computing the shortest path from S to E. (20)



OR

Find The critical path of the following project. Find out which activities can be delayed without effecting the overall estimated time. Compute the estimated time and variance of critical path. (5 + 8 + 7)

Activity	Description	Immediate Predecessor	Duration (weeks)
A	[illegible]	-	[illegible]
B	[illegible]	A	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
K	[illegible]	[illegible]	[illegible]

CO1: Estimate the roots of polynomials, and Compute the Interpolation of polynomials. (K3, A2)

CO2: Compute derivatives and integration and solve differential equations. (K3, A2)

CO3: Solve and analyze simultaneous linear equations (K3, A2)

CO4: Construct Linear Programming and solve them using graphical methods and simplex methods and dual problems (K3,A2)

CO5: Illustrate Network problems (K3, A2)