

B. Power Engineering 2nd Year 1st Semester Examination, 2019

Numerical Methods & Computer Programming

Time – 3 hours

Full Marks - 100

Answer any five questions

1. a. Determine output of the following programs and include brief justifications for the output.
Answer any 10. 10*2

A	<pre>main(){ char i=0; for(;i>=0;i++); printf("%d\n", i); }</pre>	B	<pre>main() { int i, j; for (i=1,j=5; i<j; i+=2,j++) printf("%d %d\n", i, j); }</pre>	C	<pre>main(){ int b=5; printf("%d\n", b++); printf("%d\n", ++b); }</pre>
D	<pre>main(){ int i= 2; switch(i){ case 1: printf("case 1"); case 2: printf("case 2"); case 3: printf("case 3"); case 2+2: printf("case 4"); default: printf("default"); } }</pre>	E	<pre>main() { int i, j, count = 0; for (i = 1; i <= 30; i++) { for (j= 1;j <= 40;j++) { count++; } } printf("Count=%d\n", count); }</pre>	F	<pre>main(){ int i, j; i=5; while(i<100){ j=i+5; if(j==15) break; i++; } printf("%d", i); }</pre>
G	<pre>main(){ int a=1, b=2; { int a=3; printf("%d %d\n", a, b); { int b=4; printf("%d %d\n", a, b); } } }</pre>	H	<pre>main(){ int i, k = 5; if (i = k) { printf ("YES\n"); } else { printf ("NO\n"); } }</pre>	I	<pre>main(){ int i=0; do{ i++; if(i%10==0) continue; printf("%d\n", i); }while(i<50); }</pre>
J	<pre>int main(){ int i=1; do { printf("%d\n", i); i++; if(i < 15) continue; }while(false); }</pre>	K	<pre>main(){ int i; char a[8]={0,1,2,3,4,5,6,7}; char *p=a; for(i=0;i<5;i++) *p++= 'a'; *p = 0; printf("%s\n", a); }</pre>	L	<pre>main(){ int b=55; for(;b=b>>1) printf("%d\n", b); }</pre>
M	<pre>int f(int x){ x=x*x; return(x); } main(){ int x=5; printf("%d %d", x, f(x)); }</pre>	N	<pre>main(){ int i; int count = 10; int sum = 0; for (i=1; i<=count; i++) sum += i; printf("sum is %d\n", sum); }</pre>	O	<pre>main(){ int a[4]={5, 4, 3, 2}; int *p=&a[1]; printf("%d\n", *p++); printf("%d\n", ++*p); }</pre>

2. a. What is a pointer in C and why it is useful? 2
 b. Write a program to count the number of unique characters in a string input by the user. 8
 c. Write a program which takes the names, rolls and marks obtained in 6 subjects for a set of students as input from the user and prints the merit list, i.e., the names and rolls of the students in decreasing order of their total marks. 10

3. a. Write 2 functions, one iterative and the other recursive, to find out the sum of the individual digits of an integer number. 8
 b. Write a program to find whether a square matrix is symmetric or not without computing its transpose matrix (i.e., without taking a second 2-dimensional array). 6
 c. Write a program to print the m^{th} to n^{th} fibonacci numbers where m and n are input by the user. 6

4. a. Write a program which reads numbers from a file and outputs the number of whole numbers present in the file. Assume that there is one number per line in the file. 5
 b. Write a program that accepts an integer number and prints the binary equivalent of the number. 5
 c. Given the following set of tabular values, find the derivative at $x = 0.75$. 6

x	0.0	0.2	0.4	0.6	0.8
y	0.0	0.1823	0.3365	0.47	0.5879

- d. Discuss the Newton Raphson method for solving nonlinear functions together with its graphical interpretation. 4
5. a. Find the root of the equation $x^3 - d = 0$ correct up to 3 decimal places (or first 5 iterations), using the following methods. Compute d as $d=30 + \text{your exam roll number} \% 2$, i.e., $d=31$ for odd exam roll numbers and $d=30$ for even exam roll numbers. 5*4
- Bisection method.
 - Regula Falsi method.
 - Newton Raphson method, and
 - Secant method.

6. a. Define Eigenvalue and Eigenvector of a square matrix. 2
 b. Solve the following set of linear simultaneous equations by the Gauss-Jordan elimination method.

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

$$-x + 3y + 2z = 15$$

$$3x - 2y + z = 4$$

- c. Find the Eigenvalues and the corresponding Eigenvectors for the following square matrix. 10

$$A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

7. a. Discuss how you can find the largest Eigenvalue of a square matrix. 2

b. Find the relationship between the following pairs of operators:

i. forward difference operator (Δ) and backward difference operator (∇)

ii. central-difference operator (δ) and shift operator (E).

iii. averaging operator (μ) and shift operator (E). 3*2

c. Given the following table of values, find the values of y at $x=0.175$ and 0.72 . 6

x	0.0	0.2	0.4	0.6	0.8
y	0.0	0.1823	0.3365	0.47	0.5879

d. Evaluate the following integral by Trapezoidal method considering the error tolerance of 0.001. 6

$$I = \int_{1.5}^{2.5} \frac{1}{x+1} dx$$