Shahjalal University of Science & Technology
Institute of Information and Communication Technology
Program: Software Engineering
1st Year 1st Semester Examination, 2018
Session: 2017-18
Course: MAT-105* (Coordinate Geometry and Calculus)
Full Marks: 100   **Credit: 3.0**   **Time: 3 Hours**

Group – A
(Answer Any Two Questions)

1.

a. Find the equation of the straight line which passes through the intersection of $2x + 5y - 1 = 0$, $x - 3y + 2 = 0$ and makes equal intercept on the axes. **4**

b. Find the angle between the line $3x - y + 3 = 0$ and the line perpendicular to $\frac{1}{2}x - \frac{1}{3}y + 1 = 0$. **5**

$x^2 + y^2 = 2 \cdot 9x$

c. Find the equation of the circle passing through the intersection of the circle S $x^2 + y^2 = 2by$ and having its center on the line $\frac{x}{a} - \frac{y}{b} = 2$ **4**

d. Find the equation of the parabola whose focus is at (-1, 2) and directrix $x - 2 = 0$. What is the vertex of the parabola? Sketch the graph of it. **5**

e. Find the center, vertices, foci and length of the minor axis of the ellipse. **4**
$$2x^2 + 5y^2 = 10$$

f. Find the eccentricity of the hyperbola $\frac{x^2}{5} - \frac{y^2}{4} = 1$ **3**

2.

a. Find the standard equation of the conic $2xy = 9$ by rotating the axes through an angle $\frac{\pi}{4}$ radians about the origin. Identify the conic. **4**

b. Find the rotation α so that the equation $2x^2 + \sqrt{3}xy + y^2 - 10 = 0$, has no xy term and hence identify the curve. **4**

c. Define direction cosines and direction ratios of a straight line. P and Q are (1, -5, 7) and (-3, 6, -2). Find the direction cosines of OP, OQ, and PQ. **4**

d. Find the direction cosines of the line which is equally inclined to the axes. **3**

e. Find the angle between the planes $2x - 3y + 5z + 1 = 0$ and $x - 3y + z + 2 = 0$ **3**

f. Find the centre and radius of sphere $x^2 + y^2 + z^2 + 3x - 6y + 1 = 0$ **3**

g. Identify the surfaces- **4**

i.	$\frac{x^2}{4} + \frac{y^2}{6} - \frac{z}{6} = 0$		ii.	$\frac{x^2}{3} + \frac{y^2}{5} - \frac{z^2}{4} = 0$
iii.	$\frac{x^2}{9} + \frac{y^2}{8} - \frac{z^2}{3} = 1$		iv.	$x^2 - y^2 - z = 0$

3.

a. Define function, domain and range of a function. Find the domain and range of following functions: **8**

i.	$y = \sqrt{4 - x^2}$	ii.	$y = \frac{|x|}{x}$
iii.	$y = \ln(2x - 1)$		

Also sketch the graph of the function.

b. Find the left hand limit and right hand limit and limit of the function $f(x) = \sqrt{1 - x^2}$ at x = 1 **3**

c. Test the continuity of the step function- **3**
$$f(x) = \begin{cases} e^x & \text{if } x < 0 \\ 1 & \text{if } x \geq 0 \end{cases}$$
at x = 0

d. Find the derivative of the functions: **6**

i.	$f(x) = \ln(x^2 + 1)\sin^2 2x$	ii.	$f(x) = x^x$

e. Find the nth derivative of $\tan^{-1}\frac{x}{a}$ **5**

Group – B
(Answer Any Two Questions)

4.

   a. State the Rolle's theorem and the Mean Value Theorem. Deduce the Rolle's Theorem from the Mean Value Theorem.   4

   b. Find the maximum and minimum values of the function $f(x) = x^4 - 5x^3 + \frac{9}{2}x^2 - 1$ 5

   c. Define the Tylor series and Maclaurin series generated by a function. Find the Tylor series of the function $f(x) = \ln(1+x)$ at $x = 1$ 6

   d. Let $f(x,y) = \frac{2y}{y+\cos x}$. Then find-   6

i.	f_{xx}	ii.	f_{xy}

   e. If the resistors of R1, R2 and R3 ohms are connected in parallel to make and R-ohm resistor, the value of R can be found from the equation-   4

$$\frac{1}{R} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3}$$

    Find the value of $\partial R / \partial R2$ when R1 = 30, R2 = 45 and R3 = 90 ohms.

5.

   a. Evaluate the integrals-   12

i.	$\int \frac{dx}{\sqrt{x^2-4x+3}}$	ii.	$\int \frac{dx}{3+2\cos x}$
iii.	$\int_0^{2a} \frac{dx}{\sqrt{(2ax-x^2)}}$		

   b. State and prove the fundamental theorem of integral calculus.   4

   c. Evaluate the integral-   4

$$\int_0^2 x^2 dx$$

   -0.26

   As a limit of Riemann sums.

   d. Use reduction formula to evaluate the integral-   5

$$\int \sin^2 x \cos^3 x \, dx$$

6.

   a. Evaluate the improper integral-   5

$$\int_0^2 \frac{dx}{(x-1)^{\frac{2}{3}}}$$

   b. Define Gamma function and hence find $\Gamma(3)$ 4

   c. Write the relation between Beta and Gamma function. Use the relation to evaluate $\beta(3,2)$ 4

   d. Find the area of the segment of the parabola $y = (x-1)(4-x)$ cutoff by the x-axis.   4

   e. Find the volume of the solid generated by revolving the region bounded by $y = \sqrt{x}$ and the lines y=1, x = 4 about the line y=1   4

   f. Find the volume of the washer generated by revolving the region bounded by the curves $y = x^2$ and $y = \sqrt{x}$ about the x-axis.   4

Technology
BSc (Engg.) in Software Engineering
1st Year 1st Semester Examination, 2018
Session: 2017-18
Course: SWE 121 (Structured Programming Language)
Full Marks: 100   Time: 3 Hours

Note: Answer four questions taking any two from each group. Figures at right margin show marks.

Group - A

1.a) Explain the basic data types in C with their memory requirement.
 b) What is type casting in C? Show with an example.   4
 c) What is escape sequence? Give examples.   3
 d) Identify the purpose of each of the following expressions: 3
   i) ceil(x), ii) floor(x+y), iii) sqrt(x*x+y*y), iv) pow(2, 3.0) and v) sin(x-y).   5
 e) Consider the following program fragment. What will be the output?   4

```
int main() {
    int a = 10;
    printf("\n %d %d", a, a++);
    a = 10;
    printf("\n %d %d", a++, a);
    . a = 10;
    printf("\n %d %d %d ", a, a++, ++a);
}
```

 f) If a =10, b = 5 and c = 20, what will be the truth value of the following expressions: 4
   i) !(a > 10), ii) (a>=5) && (b==5), iii) (a + b) > c ⟨ (c < 30), iv) (a < 5) || (b > c) && (c >10)
 g) How are comments used in a C program? Give examples.   2

2. a) For the following *for* statement, write an equivalent *while* statement.   3

```
for (<init-stmnt>; <boolean-expr>; <incr-stmnt>)
{
    <body-statements>
}
```

 b) Distinguish between *while(1)* and *while(0)* with example.   4
 c) What will be the output of the following C code?   3

```
int main(void)
{
    if (printf("Hello World")) ;
}
```

 d) Write the output of the following program fragments shown in Figs. 1 and 2.   5+5

```
int main(){
    int i,j;
    for(i=0;i<10;i++)
        for(j=0;j<100;j++);
        printf("%d\t%d\n",i, j);

    for(i=0;i<100;i++)
        for(j=0;j<10;j++);
    · printf("%d\t%d\n",i, j);
}
```
          Fig. 1

```
int main() {
    int i, j;
    for (i = 0; i < 5; i++) {
        for (j = 1; j <= 10; j++) {
            if (j > 3) break; continue
            printf("*");
        }
        printf("\n");
    }
}
```
          Fig. 2

 e) What will be the output of the program in Fig. 2 if the keyword *break* is replaced with *continue*?   5

3.a) What are the advantages of structured programming?   2
 b) Rewrite the following program using structured programming approach.   5

```
#include <stdio.h>
double balance = 100000;
int main( ) {
    double amount;
    printf("Enter amount to deposit:");
    scanf("%lf", &amount);
    balance += amount;
    printf("Enter amount to withdraw:");
    scanf("%lf", &amount);
    balance -= amount;
    printf("Your current balance: %lf", balance);
}
```

 c) Write an appropriate function call for each of the following functions.   4

```
i. void exchange(int &x, int &y)
{
    //function body
}
```
```
ii. float area(float r) {
    return 3.14*r*r;
}
```

 d) How is an array name interpreted when it is passed to a function?   2

e) What are the criteria of a recursive program?

f) Let a recursive function R is defined as $R(a,b) = \begin{cases} 0, & if\ a < b \\ R(a-b,b)+1, & if\ b \le a \end{cases}$

What is actually performed by the above function? Find the value of R(16, 3) and R(200, 6).

g) What are the differences between global and local variables? Show with example.

4

Group - B

4.a) Assume a one dimensional array x[] = {1,2,3,4,5,6,7,8,9,10,11,12}. Write C code to assign the elements to a 2D array y[3][4].   4

b) Pass the array y[3][4] in (a) to a function and display the elements in matrix form.   5

c) How do you use variable sized array in C? Show with an example.   3

d) Describe what values are assigned to the individual array items.   5
int z[12]={0, 8, 0, 0, 7}, char flag[] = "TRUE", char flag[4] = {'T', 'R', 'U', 'E'}, int p[2][4]={1, 3, 5, 7};

e)   8

```
i. #include <stdio.h>
int main ( )
{
int i, y = 0;
char s[] = "Programming with C"};
for (i = 0; s[i] !='\0'; ++i) {
  if ((i % 2) == 0) y += x[i];
  printf("%c%c", s[i], s[i]);
  }
}
```

```
ii. #include <stdio.h>
int main( )
{
int a, b, c=99;
int x[][4] = {1,2,3,4,5,6,7,8,9,10,11,12};
for (a = 0; a < 3;  ++a) {
for (b = 0; b < 4;  ++b) {
  if (x[a][b] < c) c = x[a][b];
  printf("%d ",c);
}
}}
```

5.a) Distinguish between a string and a character array.   2

b) What will be the output of the following programs?   5+5

```
i. #include <stdio.h>
int funct(int x) {
  int y;
y = x* x;
return y;
}
int main ( )
{
int a, count, sum=0;
for(count=1;count<=10;++count) {
  a = funct(count);
  printf("%d ", a);
  sum += a;
}
printf("\nSum: %d", sum);
return 0;
}
```

```
ii. include <stdio.h>
int funct(int *p)
{
int i;
for (i = 0; i< 5; i++)  *(p+i) = *(p+i)/ *(p+i);
}
int main( )
{
int i, a[] = {10, 20, 30, 40, 50};
funct(a);
for (i = 0; i< 5; i++)
  printf("%d ", a[i]);
}
```

c) What are the problems with the following programs: 5

```
i. #include <stdio.h>
int main ( ) {
float radius; area;
printf(Radius = ?");
scanf("%f", radius);
area = 3.14159 * radius * radius;
printf("Area: %f, &area);
return 0;
}
        /* CODE A*/
```

```
ii. #include <stdio.h>
int main ( ) {
int 2repeat = 10;
for (int i=0; i<2repeat; i++) {
  printf("Hello Bangladesh \n");
}
return 0;
}
        /* CODE B */
```

d) For two given strings S1 and S2, swap the value of S1 and S2, if S1 > S2.   4

e) Rewrite the program in (d) so that it allocates memory for S1 and S2 using dynamic memory allocation.   4

6.a) Define a structure CourseResult with members Attendance, Perf, and Final. Write a program to calculate the letter grade of a course using the structure CourseResult (as per SUST rules).   6

b) Declare an array of size 50 of type CourseResult and print how many students got A+.   5

c) Distinguish between the file opening modes "r" and "r+" and "w" and "a".   4

d) Write a program to write the CourseResult information in (b) into a text file.   5

e) Rewrite the program in (b) to display the information reading from the text file.   5

University of Science & Technology
Institute of Information and Communication Technology
Discipline: Software Engineering
1st year 1st Semester Final Examination, 2018
Session: 2017-18

Course Code: EEE 101W
Course Title: Basic Electrical and Electronic Circuits

Time: 3 Hours
Total Marks: 100

Answer four questions taking two from each part. Figures at right margin show marks.

Part A

1. a) The current flowing through a point in a circuit is shown in fig. 1. Find the total charge flowing through that point in the circuit. (5)
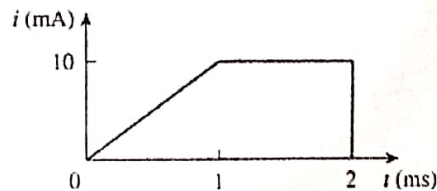
Figure 1: for question 1(a)

b) Fig. 2 shows the current through and voltage across a given device. Find the total energy absorbed by the device for the period of $0 < t < 4s$. (8)
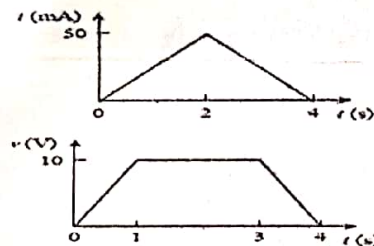
Figure 2: for question 1(b)

c) Determine V in the circuit shown in fig. 3. (7)
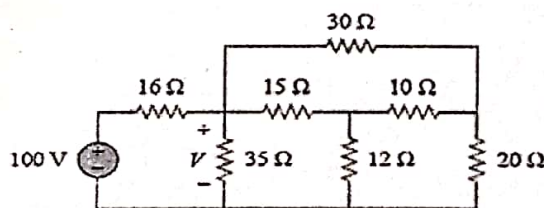
Figure 3: for question 1(c)

d) Determine powers dissipated in the resistors in the circuit shown in fig.4. (5)
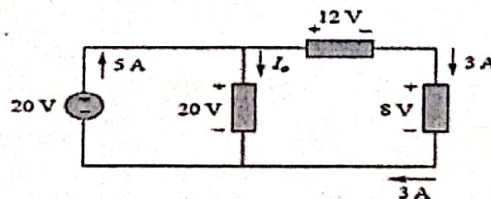
Figure 4: for question 1(d)
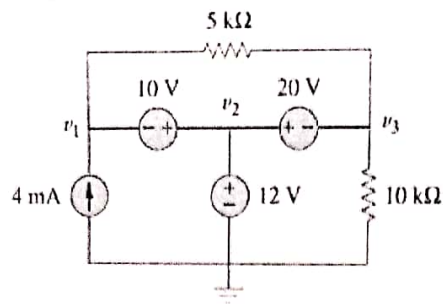
(a)
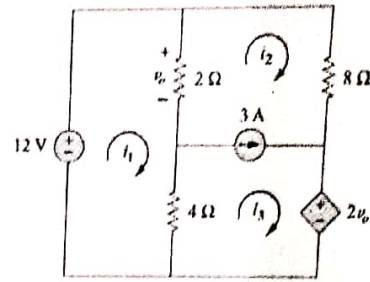
(b)
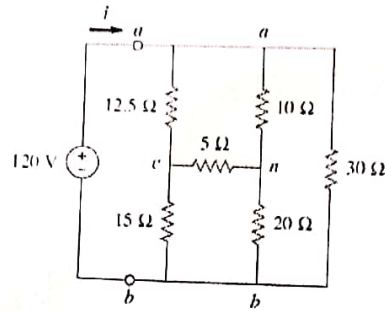
(c)

Figure 5: (a) for question 2(a) (b) for question 2(b) (c) for question 2(c)

2. a) Using nodal analysis, obtain node voltages v_1, v_2, v_3 in the circuit of figure 5(a) (7)
   b) Using mesh analysis, obtain i_1, i_2, i_3 in the circuit of figure 5(b) (9)
   c) Obtain the equivalent resistance R_{ab} for the circuit in fig 5(c) and use it to find current i. (9)

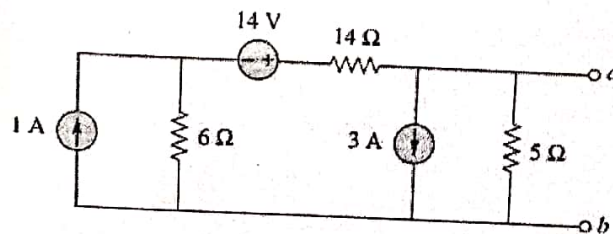3. a) Find the Thevenin and Norton equivalents at terminals $a - b$ from figure (6) (12)

Figure 6: for question 3(a)

b) Why superposition principle is not applicable in power calculation? Prove that, maximum power $P_{max} = \frac{V_{th}^2}{4R_{th}}$ (5)

c) Compute the value of R that will result in maximum power transfer to the 10Ω resistor as shown in figure 7. Find the maximum power. (8)
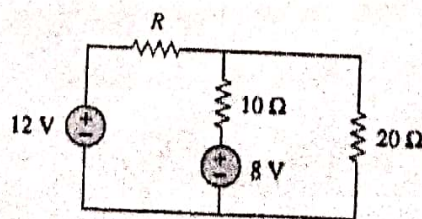
Figure 7: for question 3(c)

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4. a) Determine v_o in the op-amp circuit of figure 8, show details calculation without using formula. (5)
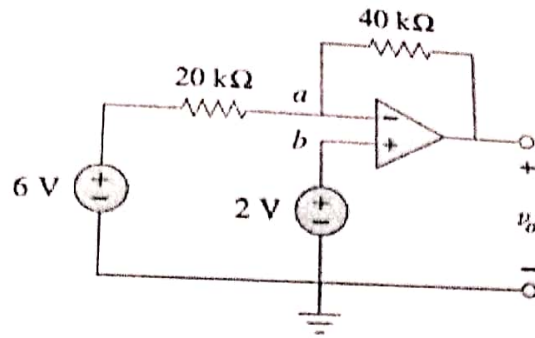

Figure 8: for question 4(a)

b) Design an Op-amp circuit with inputs v_1 and v_2 such that $v_0 = -5v_1 + 3v_2$. (10)
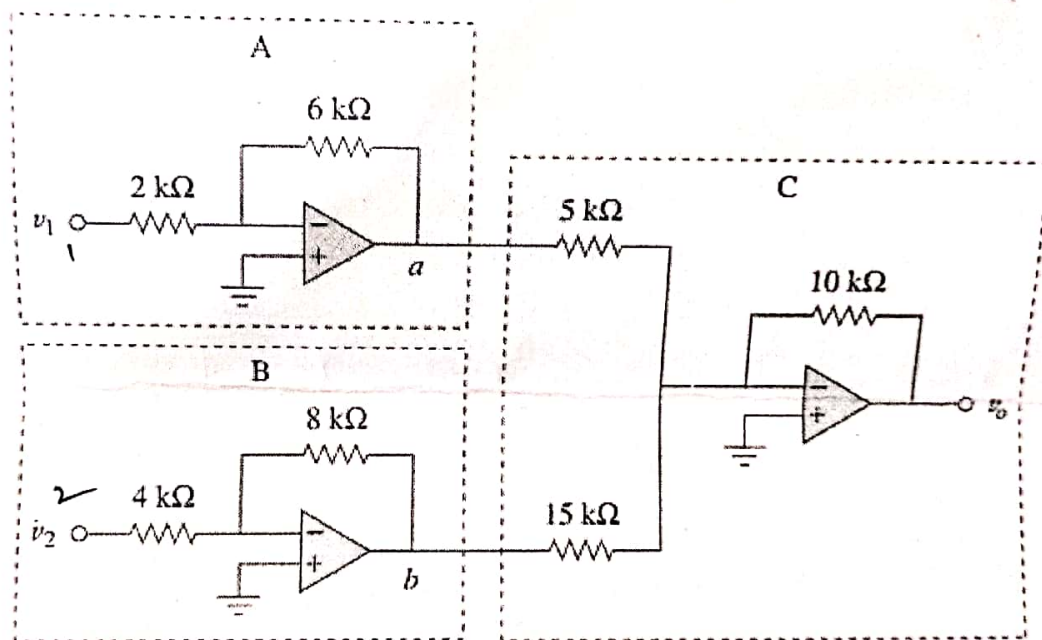c) If $v_1 = 1V$ and $v_2 = 2V$, find the v_o of the circuit of figure 9. (10)

Figure 9: for question 4(c)

5. a) Determine the current through a 200 μF capacitor whose voltage is shown in figure 10. (9)
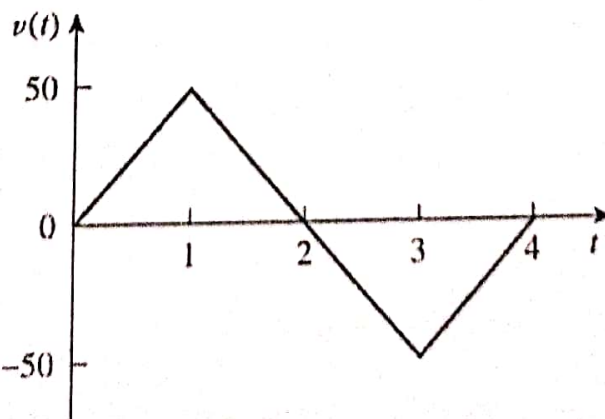

$\frac{R_2 \left(1 + R_1/R_2\right)}{R_1 \left(1 + R_0/2R_4\right)} v_2 - \frac{R_2}{R_1} v_1$

Figure 10: for question 5(a)

b) Obtain the energy stored in the capacitors under dc condition from figure 11. (8)
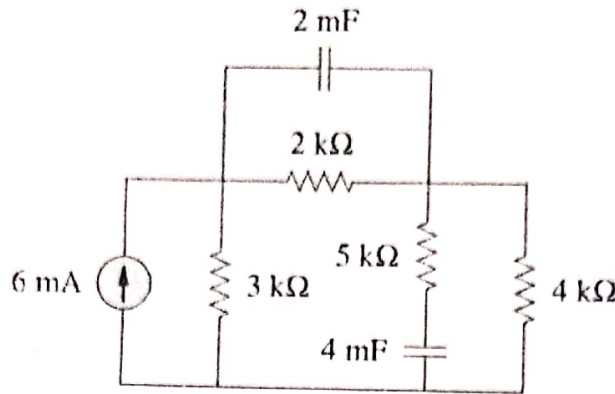

Figure 11: for question 5(b)

c) If $v_1 = 10\cos 2t$ mV, and $v_2 = 0.5t$ mV, find v_o in the op-amp circuit of figure 12. (8)
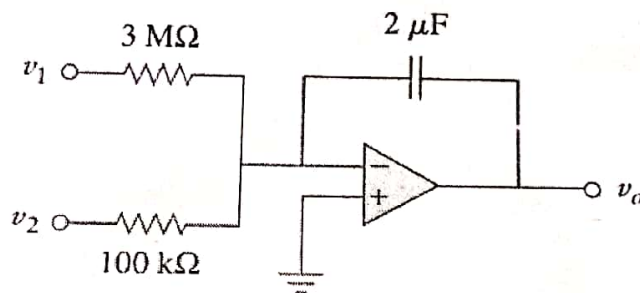

Figure 12: for question 5(c)

6. (a) Reduce the following Boolean expressions to the indicated number of literals- (9)
(i) $A'C' + ABC + AC'$ to three literals
(ii) $(x'y' + z)/ + z + xy + wz$ to three literals
(iii) $A'B(D' + C'D) + B(A + A'CD)$ to one literal

b) A manufacturing plant needs to have a horn sound to signal quitting time. The horn should be activated when either of the following conditions is met: (8)
i. Its after 5 oclock and all machines are shut down.
ii. Its Friday, the production run for the day is complete, and all machines are shut down.
Design a logic circuit that will control the horn. c) Design a 8 × 1 MUX by using 2 × 1 MUX. (8)