

**Bangabandhu Sheikh Mujibur Rahman Science and Technology University**

**Department of Computer Science & Engineering**

**1<sup>st</sup> Year 1<sup>st</sup> Semester B.Sc. Engineering Examination-2018**

**Course Title: Differential and Integral Calculus**

**Course Code: MAT105**

**Full Marks: 60**

**Time: 3(Three) Hours**

**N.B.**

i) Answer **SIX** questions, taking any **THREE** from each section.

ii) All questions are of equal values.

iii) Use separate answer script for each section.

**SECTION-A**

**Q.1 (a)** Define limit of a function. Find the limit of the function (if exist) at the point  $x = 0$ . **03**

$$f(x) = \begin{cases} e^{\frac{|x|}{2}} & ; \text{ when } -1 < x < 0 \\ x^2 & ; \text{ when } 0 \leq x < 2 \end{cases}$$

**(b)** Define continuous function. Test graphically the following function is continuous or not. **03**

$$f(x) = \begin{cases} 1 & ; \text{ when } x < 0 \\ 0 & ; \text{ when } x = 0 \\ -1 & ; \text{ when } x > 0 \end{cases}$$

**(c)** Discuss the differentiability at  $x = \frac{\pi}{2}$  of the function **04**

$$f(x) = \begin{cases} x & ; \text{ when } x < 0 \\ 1 + \sin x & ; \text{ when } 0 \leq x < \pi/2 \\ 2 + (x - \pi/2) & ; \text{ when } x \geq \pi/2 \end{cases}$$

**Q.2 (a)** By using the definition of differentiation prove that  $\frac{d}{dx}(e^{\tan^{-1} x}) = \frac{e^{\tan^{-1} x}}{1+x^2}$  **03**

**(b)** If  $y = e^{ax} \cos(bx + c)$  then prove that  $y_n = (a^2 + b^2)^{\frac{n}{2}} e^{ax} \cos\left(bx + c + n \tan^{-1} \frac{b}{a}\right)$  **03**

**(c)** If  $y = e^{a \sin^{-1} x}$  then prove that  $(1-x)^2 y_{n+2} - (2n+1)xy_{n+1} - (n^2 + a^2)y_n = 0$ . **04**

**Q.3 (a)** State L'Hospital's theorem. By using this, evaluate  $\lim_{x \rightarrow 0} \frac{e^x - e^{-x} - 2x}{x - \sin x}$ . **03**

**(b)** State Mean Value Theorem. In the Mean Value Theorem  $f(a+h) = f(a) + hf'(a+\theta h)$ , if  $a=1$ ,  $h=3$  and  $f(x) = \sqrt{x}$ , find  $\theta$ . **04**

**(c)** Show that, the maximum value of  $x + \frac{1}{x}$  is less than its minimum value. **03**

**Q.4 (a)** State and prove Taylor's theorem with Lagrange form of remainder. **05**

**(b)** If  $f(x, y) = \begin{cases} xy \frac{x^2 - y^2}{x^2 + y^2} & \text{when } x \neq 0 \text{ or } y \neq 0 \\ 0 & \text{when } x = 0, y = 0 \end{cases}$ , then show that  $\frac{\partial^2 u}{\partial x \partial y} \neq y \frac{\partial^2 u}{\partial y \partial x}$  at the point  $(0, 0)$ . **05**

## SECTION-B

- Q.5** Evaluate (any two):
- (a) (i)  $\int \frac{dx}{(x-3)\sqrt{x^2-6x+8}}$  (ii)  $\int \frac{dx}{a+b \sin 2x}$  (iii)  $\int \frac{2 \sin x + 3 \cos x}{7 \sin x - 2 \cos x} dx$  07
- (b) If  $u = u(x)$  and  $v = v(x)$  be two differential  $n$ -times function of then 03
- $$\int uv dx = uv_1 - u'v_2 + u''v_3 - u'''v_4 + \dots + (-1)^{n-1} u^{n-1} v_n + (-1)^n \int u^n v_n dx$$
- Where  $u^n$  stands for  $\frac{d^n u}{dx^n}$  and  $v_n$  stands for  $\int v_{n-1} dx$ .
- Q.6** (a) Find the reduction formula for  $\int \tan^n x dx$  and hence evaluate  $\int \tan^9 x dx$  04
- (b) Define Beta and Gamma function. Show that,  $\beta(l, m) = \beta(m, l)$ . 03
- (c) Prove that,  $\int_0^{\pi/2} \sin^p \theta \cos^q \theta d\theta = \frac{[\frac{p+1}{2}][\frac{q+1}{2}]}{2[\frac{p+q+2}{2}]}$ . 03
- Q.7** (a) State and prove Wallis's formula. 05
- (b) Write down six general properties of definite integrals. 02
- (c) Evaluate  $\int_0^{\pi/2} \ln(\sin x) dx$  03
- Q.8** (a) Find the area of the region bounded by the asteroid  $x^{2/3} + y^{2/3} = a^{2/3}$ . 05
- (b) Find the area of the loop  $r = a \cos 3\theta$ . 05

**N.B.:** i) Answer **SIX** questions taking any **THREE** from each Section, ii) All questions are of equal values, iii) Use separate answer script for each section, iv) All symbols represent their usual meaning.

### Section-A

1. (a) Explain the concept of processor to memory communication with appropriate figure. 3  
 (b) Write down the various application of computer systems. 2  
 (c) Describe the various types of computers on the basis of applications. Draw the block diagram of input-process-output cycle of a computer. 3  
 (d) Classify the cache memory. 2
2. (a) What is cache hit? Why cache memory is used? 2  
 (b) Mention at least three input and output devices of each. Mention all the categories of keys found on a typical keyboard. 2  
 (c) Describe the instruction cycle with neat sketching. 3  
 (d) Illustrate the memory read operation with appropriate diagram. 3
3. (a) Draw a diagram to show the internal components of a Cathode Ray Tube (CRT) Monitor and explain the working principle of it. 4  
 (b) Represent -11 in the 2's complement system. 3  
 (c) What are the important of complements in computer systems? Subtract 12 from 19 using the two's complement method. 3
4. (a) List at least five important application areas of internet today. 1  
 (b) Convert  $F(A, B, C) = A'B + AB'C$  into the canonical SOP form. 3  
 (c) What do you mean by bus used in the computer system? Describe the various buses used in the computer system with the required figures. 3  
 (d) Reduce the expression  $F = \Sigma(0, 2, 3, 4, 5, 6)$  using k-map and then draw the logic diagram. 3

### Section-B

5. (a) Classify the computer software. Differentiate between hardware and software of a computer. 3  
 (b) Mention at least ten utility programs that are added to an operating system to perform many different tasks. 2  
 (c) What are the functions of Debuggers and Source code editor? 2  
 (d) What is nibble and gigabyte? What are the differences between programmable ROM and erasable programmable ROM? 3
6. (a) Write down the function for adding 4 column values in MS-Excel. 2  
 (b) Write a short note on the following commands: i) MD, ii) CD, iii) DATE, iv) CLS 2  
 (c) How are modems used for the purpose of data communication? 3  
 (d) Mention the difference between Client Server Network (CSN) and Peer-to-Peer Network (PPN) with sketching. 3
7. (a) What do you mean by WWW, HTTP, IP, and FTP? 2  
 (b) What is meant by computer network? Differentiate among LAN, MAN and WAN networks. 3  
 (c) How can you protect your computer from virus? 2  
 (d) What is network topology? What is the difference between ring topology and bus topology? 3
8. (a) What is operating system? Explain at least five functions of operating system. 2  
 (b) What are PCB and what information is contained in it? 2  
 (c) Explain the different steps of a process with appropriate figure. 3  
 (d) Differentiate between system software and application software with the examples. 3

**N.B.**

- i) Answer **SIX** questions taking, any **THREE** from each section.
- ii) All questions are of equal values.
- iii) Use separate answer script for each section.

**SECTION-A**

- Q.1 (a) Write a program that accepts an integer number and check whether it is prime or not prime. 5
- (b) Convert the following equation to **if-else statement** and **conditional operator statement**: 5

$$\text{Salary} = \begin{matrix} 4x + 100 & \text{for } x < 40 \\ 300 & \text{for } x = 40 \\ 4.5x + 150 & \text{for } x > 40 \end{matrix}$$

- Q.2 (a) Write a program that searches any number from an array. 4
- (b) What will be the output of the following program: 4

```
int main() {
    int i, j;
    for(i=1; i<=5; i++) {
        for(j=1; j<=i; j++) {
            if(i==j)
                printf("1 ");
            else
                printf("0 ");
        }
        printf("\n");
    }
    return 0;
}
```

- (c) What do mean by the following statement? 2
- for( ; ; )

- Q.3 (a) Write a program to read three values using scanf statement and print the following results: 5
- i. Sum of the values
  - ii. Average of the three values
  - iii. Largest of the three
  - iv. Smallest of the three

- (b) The total distance travelled by a vehicle in t seconds is given by distance =  $ut + (at^2)/2$ . Where u is the initial velocity, a is the acceleration. Write a program to evaluate the distance travelled at a given time, given the values of u and a using scanf function. 5

- Q.4 (a) Represent the following code into switch statement: 3

```
int marks;
scanf("%d", &marks);
if(marks > 79) grade = "Honours";
else if(marks > 59) grade = "First Division";
else if(marks > 49) grade = "Second Division";
else if(marks > 39) grade = "Third Division";
else grade = "Fail";
```

- (b) How many times does "Hello" appear by the following program fragment? 2

```
main() {
    for(;;) {
        printf("Hello");
        if(1)
            break;
    }
}
```



- (c) Write down the result of the following code segment? 2  

```
char s1[]="Dhaka";
char s2="Gopalganj";
strcpy(s1,s2,3);
printf("%s",s1);
```
- (d) Write a **for** statement to print each of the following sequences of integers: 3  
 10 12 14 18 26 42

### SECTION-B

- Q.5 (a) Suppose, a,b,c are integer variables with initial value 10,5 and 30 respectively. Find the value of c after execution of the following statement: 2  
 $c += (a > 0 \ \&\& \ a < 10) ? a++ : a/b;$
- (b) Given the length and width of a rectangle. Write a program to compute and display its area. 4
- (c) Explain call by value and call by reference. 2
- (d) Write down the operation of following function: 2  
 fopen(), fclose(), getc() and putw().
- Q.6 (a) Write a program to reverse a string. 5  
 Sample input: "BSMRSTU"  
 Sample Output: "UTSRMSB".
- (b) Develop a program using two functions **perimeter** and **area** that reads the values of three sides a,b,c of a triangle and display its area and perimeter. 5  
 $\text{perimeter} = a+b+c$   
 $\text{area} = \sqrt{s(s-a)(s-b)(s-c)}$  where  $s = (a+b+c)/2$
- Q.7 (a) Define a structure type, **struct personal** that would contain name, age, salary. Using this structure, write a program to read this information for one person from the keyboard and print these values. 4
- (b) Convert the following code by for statement: 2  

```
n=1;
while(n<=10)
{
    sum=sum+n;
    n=n+1;
}
```
- (c) What is function prototype? 2
- (d) What are the differences between malloc () and calloc ()? 2
- Q.8 (a) Difference between array and pointer. 2.5
- (b) What will be the output of y for the following statement 2.5  

```
int x=9,y;
int *ptr;
ptr = &x;
y=*ptr;
```
- (c) Write down the function of strcpy, strstr, strlen with example? 5

**Course Code: EEE105**  
**Full Marks: 60**

**Course Title: Electrical Circuit Analysis**  
**Time: 3 hours**

**N.B.**

- i) Answer any **THREE** questions.
- ii) All questions are of equal values.
- iii) Use separate answer script for each section.

**SECTION-A (30 Marks)**

- Q.1 (a) State the Ohm's law. Mention the main characteristics of series and parallel circuits. 2
- (b) Find the values of  $V_1$ ,  $V_2$ , and  $V_3$  from the following circuit in figure- 1(b). 3

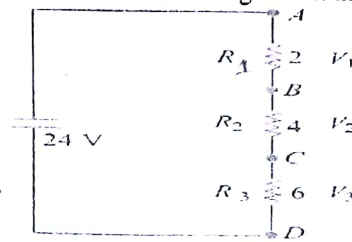


Figure- 1(b)

- (c) Calculate the effective resistance of the following combination of resistances and the voltage drop across each resistance when a P.D. of 90 V is applied between points A and B. Here all resistances are in ohm.

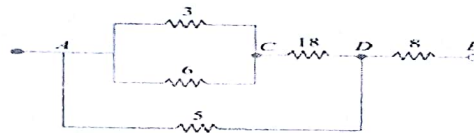


Figure-1(c)

- Q.2 (a) What is Opens,, in a Series Circuit? What is Opens,, in a parallel Circuit? 3
- (b) "Resistance of each arm of the star is given by the product of the resistances of the two delta sides that meet at its end divided by the sum of the three delta resistances"- Prove the statement.
- (c) A resistance of  $10\ \Omega$  is connected in series with two resistances each of  $15\ \Omega$  arranged in parallel. What resistance must be shunted across this parallel combination so that the total current taken shall be 1.5 A with 20 V applied?

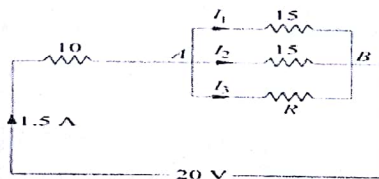


Figure-2(c)

- Q.3 (a) Explain the Kirchhoff's voltage law and Kirchhoff's current law with proper circuit examples. 3
- (b) Using Norton's and Thevenin's theorem, compute current through the  $1\text{-}\Omega$  resistor of Figure- 3(b). Compare the two calculations. Will it be same? Here all resistances are in ohm. 7

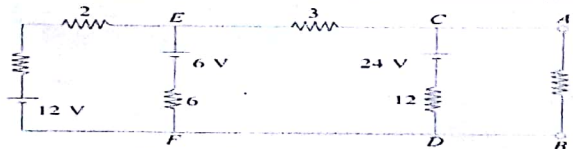


Figure-3(b)

- Q.4 (a) Find the sinusoidal expression for the current if the resistor is  $10\Omega$ . Sketch the curves for  $v$  &  $i$ . 6  
 a.  $v = 100 \sin 377t$   
 b.  $v = 25 \sin(377t + 40^\circ)$

- (b) "The magnitude of average power delivered is independent of whether  $v$  leads  $i$  or  $i$  leads  $v$ ."- 4  
 Prove the statement.

### SECTION-B (30 Marks)

- Q. 5 (a) "The more resistive the total impedance, the closer the power factor is to 1; the more reactive 3  
 the total impedance, the closer the power factor is to 0."- Prove the statement.

- (b) Find  $C_1/C_2$  if  $C_1 = 1 + j4$  and  $C_2 = 4 + j5$ . 2

- (c) At what frequency will an inductor of 5 mH have the same reactance as a capacitor of  $0.1 \mu F$  5  
 and match the resistance level of a  $5 k\Omega$  resistor?

- Q.6 (a) Find the average power dissipated in a network whose input current and voltage are the 3  
 following:  $i = 5 \sin(433t + 40^\circ)$  &  $v = 10 \sin(433t + 40^\circ)$ .

- (b) Write down the difference between Nodal analysis and Mesh analysis. 2

- (c) Use nodal analysis to determine the voltage across  $5\Omega$  resistance of Figure-6(c). 5

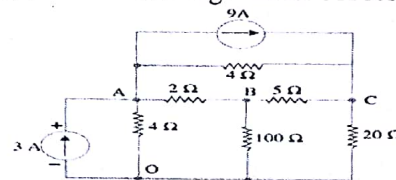


Figure-6(c)

- Q.7 (a) What is rms value? "The equivalent dc value of a sinusoidal current or voltage is or 0.707 of 4  
 its peak value"- Prove the statement.

- (b) What is Superposition Theorem? Why we use it? Using Superposition Theorem, compute 6  
 current through the  $10\Omega$  resistor of Figure-7(b).

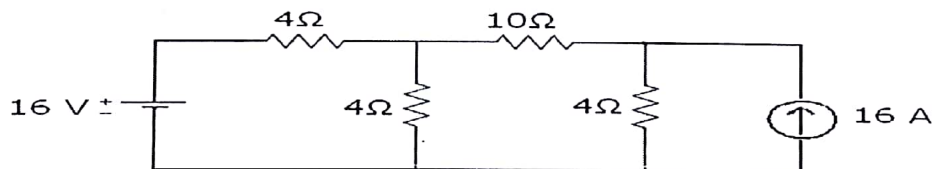


Figure-7(b)

- Q.8 (a) Use Millman's theorem, to find the common voltage across terminals A and B and the load 4  
 current in the circuit of figure-8(a).

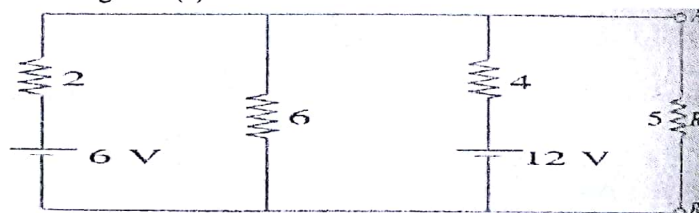


Figure-8(a)

- (b) Show that if the source current leads the applied voltage, the network is predominantly 4  
 capacitive, and if the applied voltage leads the source current, the network is predominantly  
 inductive.

- (c) The current through a  $5\Omega$  resistor is given. Find the sinusoidal expression for the voltage across 2  
 the resistor for  $i = 40 \sin (377t + 30^\circ)$ .



**N.B.**

i) Answer **SIX** questions, taking any **THREE** from each section.

ii) All questions are of equal values.

iii) Use separate answer script for each section.

**SECTION-A**

*(You have to answer question no 1 and two others)*

**Q.1** Read the passage carefully and answer the questions that follow:

The most important breakdown in the public's understanding of nuclear power is in its concept of the dangers of radiation. What is radiation, and how dangerous is it? Radiation consists of several types of subatomic particles, principally those called gamma rays, neutrons, electrons, and alpha particles, that shoot through space at very high speeds, something like 100,000 miles per second. They can easily penetrate deep inside the human body, damaging some of the biological cells of which the body is composed. This damage can cause a fatal cancer to develop, or if it occurs in reproductive cells, it can cause genetic defects in later generations of offspring. When explained in this way, the dangers of radiation seem to be very grave, and for a person to be struck by a particle of radiation appears to be an extremely serious event. So it would also seem from the following description in what has perhaps been the most influential book from the opponents of nuclear energy.

When one of these particles or rays goes crashing through some material, it collides violently with atoms or molecules along the way. In the delicately balanced economy of the cell, this sudden disruption can be disastrous. The individual cell may die; it may recover. But if it does recover, after the passage of weeks, months or years, it may begin to proliferate wildly in the uncontrolled growth we call cancer.

Before we shed too many tears for the poor fellow who was struck by one of these particles of radiation, it should be pointed out that every person in the world is struck by about 15,000 of these particles of radiation every second of his or her life, and this is true for every person who has ever lived and for every person who ever will live. These particles, totaling 500 billion per year, or 40 trillion in a lifetime, are from natural sources.

Of course every extra particle that strikes us increases our cancer risk; so many people feel that they should go to great lengths to avoid extra radiation. If that is your attitude, there are many things you can do. You can reduce it 10% by living in a wood house rather than a brick or stone house,<sup>3</sup> because brick and stone contain more radioactive materials like uranium, thorium, and potassium. You could reduce it 20% by building a thick lead shield around your bed to reduce the number of hits while you sleep, or you could cut it in half by wearing clothing lined with lead like the cover dentists drape over you when they take X-rays.

Answer these questions:

- |   |   |
|---|---|
| a. What can you do as a student to prevent radiation?   | 2 |
| b. Do you think that we can get rid of radiation by planting more trees? Explain your answer. | 2 |
| c. Suggest some ways by which we can minimize the bad effects of radiation.                   | 2 |
| d. Give a suitable title to the above text. Write the summary of the passage.                 | 4 |



- Q.2 (a)** Rewrite the following sentences using the right form of verbs : **5**
- I. I have (get) my hair cut.
  - II. They (start) a mission in the next month.
  - III. If you came, I (go).
  - IV. Each boy and each girl (have) got a prize.
  - V. Slow and steady (win) the race.
- (b)** Make sentences expressing the following attitudes/emotions ( any five): **5**  
 command; send good wishes; make an offer; request; threat; permission; suggestion; condolence
- Q.3 (a)** Change the following words as directed and make sentences with the changed words (any five): **5**  
 rapidly (adjective), fashion (adjective), comfort (adverb), necessity (adverb), vary (Noun), cool (Noun)
- (b)** Fill in the blanks with appropriate prepositions ( any five): **5**
- I. Della hugged them ----- her bosom.
  - II. The fob chain was worthy----- the watch.
  - III. We read Shakespeare's plays ----- a teacher.
  - IV. He blessed them----- heart.
  - V. The rhododendron was----- blood.
  - VI. The albatross fell ---- his neck
- Q.4** Write a paragraph in which you argue for or against the need to introduce technical education in all the high schools of Bangladesh **10**

### SECTION-B

- Q.5** Every nation is spending lots of money in maintaining an army, in furnishing it with up-to-date weapons, and in producing highly powerful and destructive armaments. No nation, however seems to feel safe, for other nations are also progressing in this destructive race of armaments. What is your opinion regarding the necessity of armaments or disarmaments? **10**
- Q.6** Suppose, you are the Managing Director of JCK Fashion Ltd. Last year your company has made a good profit and you want to give a bonus to the employees because it is one way of expressing appreciation for everyone's outstanding effort. Now, write a memo announcing the bonus. **10**
- Q.7** Suppose, a road accident has taken place on the Dhaka-Khulna highway. You as a reporter of *The Daily Star* write a report on it. **10**
- Q.8** Chevron Bangladesh Ltd. is looking for some Development Consultants. Now write an application along with CV for the post of a Development Consultant with reference to an advertisement dated on 14 May 2018 in *The Daily Star*. Application should be sent to the Country Director, Chevron Bangladesh Ltd., 12/2 Gulshan, Dhaka on or before 30 May 2018. **10**