Chittagong University of Engineering and Technology
Department of Computer Science and Engineering
B. Sc. Engineering Level-1, Term-I, Exam. 2020

Course No: CSE-141
Course Title: Structured Programming
Marks: 150
Time: 2 Hours

The figure in the right margin indicates full marks. The questions are of equal value. Answer any two questions from each section. Use separate script for each section.

SECTION-A

Q.1(a) What is variable declaration and definition? Distinguish between the following. $9\frac{1}{2}$
- i. Initialization and assignment of variables
- ii. Automated and static variables
- iii. Global and local variables

Q.1(b) Given the values of the variables x, y, z, write a C program to rotate their values such that x has the value of y, y has the value of z and z has the value of x. 13
You are only allowed to use one extra variable, named *temp*. Do not use any other variable and built-in function.

Q.1(c) Write a C program that will take a positive integer as input and displays the following patterns. The patterns need to be displayed for $n = 5$ are shown below. 15

i)
```
1 1 1 1 1
2 2 2 2
3 3 3
4 4
5
```

ii)
```
1
0 1
1 0 1
0 1 0 1
1 0 1 0 1
```

iii)
```
A A A A A
A B B B A
A B B B A
A B B B A
A A A A A
```

Q.2(a) Why code indentation is important? What kind of indentation rules you follow when writing a program? 04

Q.2(b) Write the following conditional statements into their equivalent *if-else* statement. 3 + 5 = 08
- i. $Y = X\ ?\ (2 * X) : (1.5 + X);$
- *ii.* $Y = (X\ !=\ 4)\ ?\ (X > 4)\ ?\ 1 : -1) : 0;$

Q.2(c) List the advantages of using shorthand assignment operator. Write the equivalence of the following statements. 05
$y = ++x, y* = x, y = x$ --

Q.2(d) Write the output of the following C programs. 09

i)
```
for ( i = 2; i <= 100; i ++)
{
   if (i > 10) break;
   if (i < 5) continue;
  printf("%d", i);
}
```

ii)
```
for ( i = 1; i < 10; i ++)
{
   if (i == 5) continue;
   if (i == 5) break;
   if (i == 6) continue;
  printf("%d", i);
}
```

iii)
```
for ( i = 1; i <= 10; i ++)
{
   if (i > 10) continue;
    printf("%d", i);
}
```

Q.2(e) Grade Point Average (GPA) is the weighted average of the grade points obtained in all the courses by a student in a term. GPA of a term is calculated as follows: $11\frac{1}{2}$

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$$

Where, n is the total number of courses
C_i is a real number indicating credits assigned to a particular course i and G_i is a real number corresponding to the grade awarded for i-th course

Now, you need to write a program that takes n, C_i and G_i as input and output the GPA of that student.

Q.3(a) There are three types of loop statement: **while**, **do-while** and **for**. Which one will you use at which situation? Explain with examples. 06

Q.3(b) Rewrite the following **do-while** loop to its equivalent **for** loop statement. 06

```
flag = 0;
do {
 if (flag == 0) {
   flag = 1;
   cnt = 1;
  } else {
    cnt ++;
  }
 } while (cnt ≤ 10);
```

Q.3(c) Given a matrix of size $M \times N$, write a program to count the number of unique elements on each row of that matrix. $12\frac{1}{2}$

Sample Input				Sample Output
$M = 3, N = 4$				
1	2	2	1	row-1: 2
3	3	1	1	row-2: 2
1	2	3	4	row-3: 4

Q.3(d) Given two sets of arrays, write a program to find the union and intersection of them. 13

Sample Input	Sample Output
$A = \{2, 5, 1, 7, 9\}$	Union = {1, 2, 3, 5, 7, 9}
$B = \{1. 3. 5\}$	Intersection = {1, 5}

SECTION-B

Q.4(a) Two one-dimensional arrays A and B are given, where values are integer numbers. Write a C program to merge them into a single sorted array C that contains every item from arrays A and B in ascending order. The size of array A, B and C are n, m and $n + m$, respectively. All the inputs must be taken interactively during runtime. 17

Q.4(b) Why do we need null (\0) character in string? Why it is not used in integer array? Explain. 06

Q.4(c) A string is said beautiful if it contains only of vowels (A, E, I, O, U). Now, given a string consisting of uppercase letters write a program that will find minimum number of unique characters needs to be removed to make the string beautiful. Also, write the final beautiful string in the output. $9\frac{1}{2}$

Sample Input	Sample Output
ABEEDDU	Total removed = 3
	Final string = AEEU

Q.4(d) What kind of problems may arise when reading character array after reading an integer number? How will you handle such situation? 05

Q.5(a) Describe the two ways of passing parameters to functions. When do you prefer to use each of them? Explain with example. 8

Q.5(b) A positive number N is said to be a prime number if there is exactly two numbers from 1 to N that divides N. Using this definition write a program to print all the prime numbers from 1 to 1000. 12

Q.5(c) What is recursion? Write the characteristics of a recursive function. $5\frac{1}{2}$

Q.5(d) Explain the operation of each of the following **for** loop. $8\frac{1}{2}$

i)
```
for ( n = 1; n != 10; n += 2)
sum = sum + n;
```

ii)
```
for ( n = 5; n <= m; n - = 1)
sum = sum - n;
```

iii)
```
for ( n = 1; n < 5; n++)
n = n – 1;
```

Q.5(e) Given a 2D grid of dimension $M \times N$ and the memory address of cell (0, 0), how would you find the value at cell (i, j) of that grid where i indicates row number and j indicates the column number. $3\frac{1}{2}$

Q.6(a) Write down three key differences between array and structure. $5\frac{1}{2}$

Q.6(b) Suppose you are the owner of three (i.e. *A*, *B*, *C*) criket teams. Now, define a structure called *Cricket* that will have the following information {*player id*, *player name*, *team name*, *batting average*}. Now, using *Cricket*, declare an array *Player* with 30 elements. Since you are a programmer, you have to write a *C* program to read information about all 30 players. After reading the information, print a team-wise list containing *player id*, *player name* and their *batting average*. 16

Q.6(c) Write a C program to find the second largest element in a two-dimensional array. 08

Q/6(d) Write the outputs of the following programs. 08

i)
```
#include<stdio.h>
int main()
{
  int a, b, c;
  a = (5|6) & (5|7);
  b = (10 < 11) ? 1:0;
  printf("%d\n", a && b);
  printf("%d\n", a || b);
  printf("%d\n", a + b);
  printf("%d\n", a * b);
}
```

ii)
```
#include<stdio.h>
int main()
{
  float x =10.4321;
  printf("%f\n", x);
  printf("%07.6f\n", x);
  printf("%*.*f\n", 7, 4, x);
  printf("%10.2e\n", x);
  printf("%12.4e\n", x);

}
```

END

Chittagong University of Engineering and Technology
Department of Computer Science and Engineering
B. Sc. Engineering Level-1, Term-I, Exam. 2020

Course No.: EE-181
Course Title: Basic Electrical Engineering
Marks: 150
Time: 2 Hours

This examination is conducted according to the decision of the 135th academic council meeting of CUET.

The figure in the right margin indicates full marks. The questions are of equal value. Answer any two questions from each section. Use separate script for each section.

Section-A

Q.1(a) With an appropriate figure, show how power is distributed in series circuit. For the series circuit shown in **Figure 1(a).** (i) Determine the total resistance R_T . (ii) Calculate the current Is. (iii) Determine the voltage across each resistor. (iv) Find the power supplied by the battery. (v)Determine the power dissipated by each resistor. (vi) Show whether the total power supplied equals to total power dissipated. 10

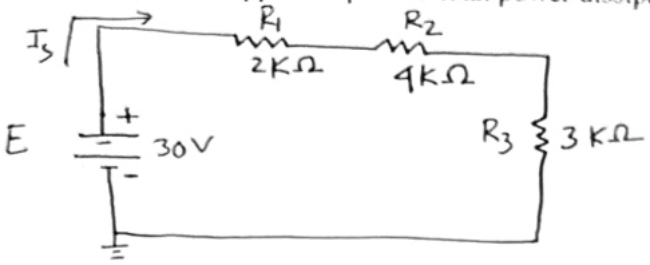

Fig. 1(a)

Q.1(b) Determine the distance between two charges of **20 μC** and **10 μC** if the force between the two charges is **3.6×10^{4} N**. 6

Q.1(c) A personal computer takes 500W power. How long can you run the computer for TK **100** if the electricity bill is TK **4.5 per KW-hr**. 6.5

Q.1(d) Design the voltage divider circuit **in Fig. 1(d)** such that the voltage across R_1 will be three times the voltage across R_2; That is **$VR_1=3VR_2$**. 15

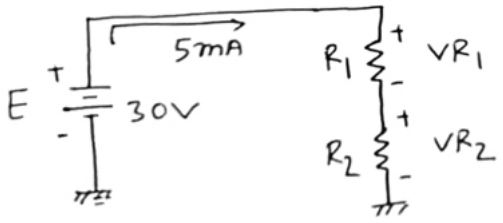

Fig. 1(d)

Briefly explain the process of converting a practical voltage source to its equivalent current source.

Q.2(a) For the network in Fig. 2(a): (i) Determine the R_T (ii) Find the I_S, I_1, and I_2. (iii) Find voltage V_4. 10

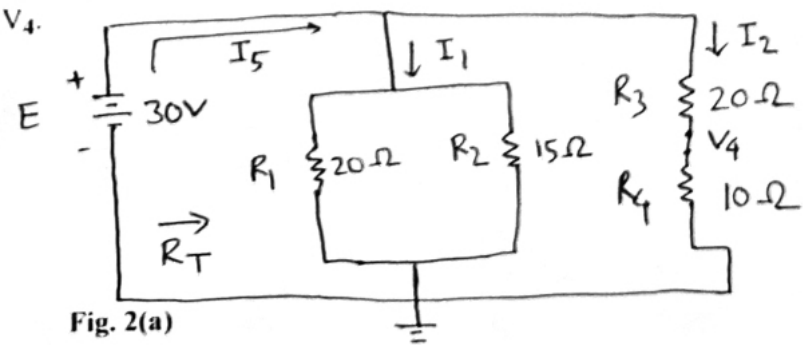

Fig. 2(a)

Q.2(b) Using branch-current analysis, find the current through each resistor for the network in Fig. 2(b). 10

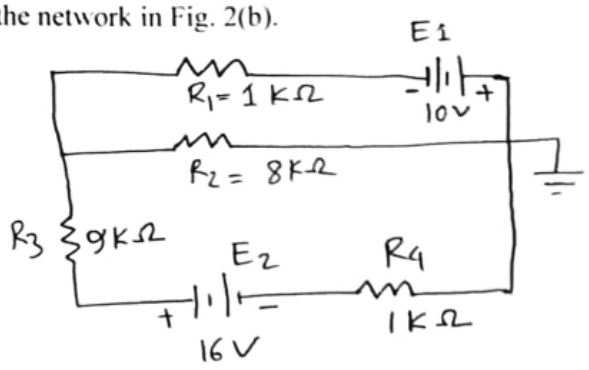

Fig. 2(b)

Q.2(c) Using Δ-Y and Y-Δ conversion, find the current I of Fig. 2(c). 09

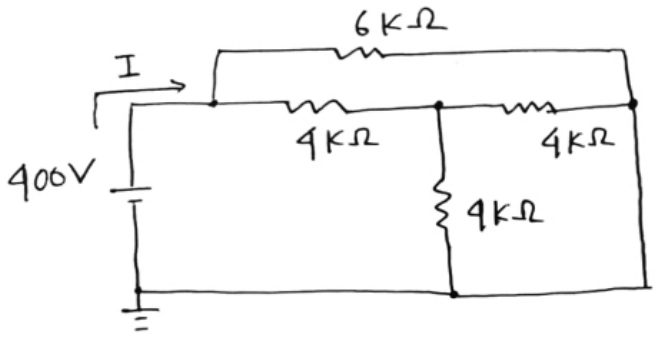

Fig. 2(c)

Q.2(d) Determine the node voltages for the network in Fig. 2(d) 8.5

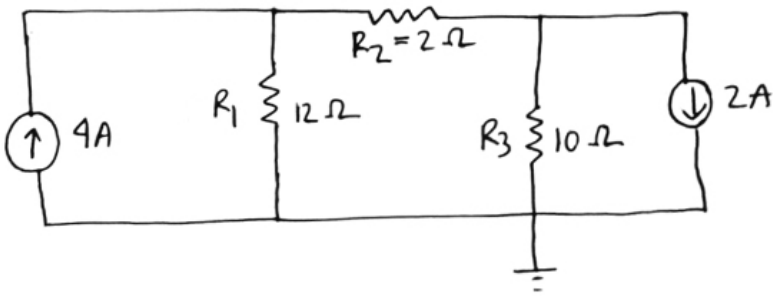

Fig. 2(d)

Q.3(a) Using superposition theorem, find the voltage V2 for the network of Fig. 3(a). 8

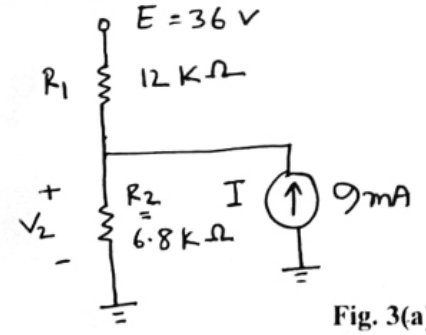

Fig. 3(a)

Q.3(b) Determine the current I for the network of Fig. 3(b). 10

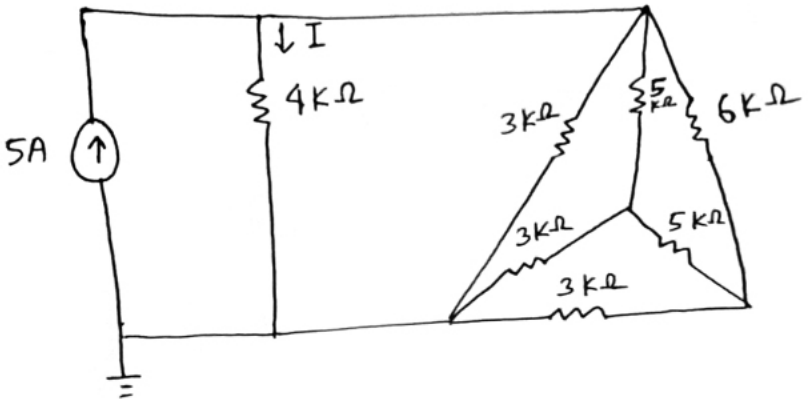

Fig. 3(b)

Q.3(c) Find the thevenin equivalent circuit for the network external to the resistor R of Fig. 3(c). 9.5

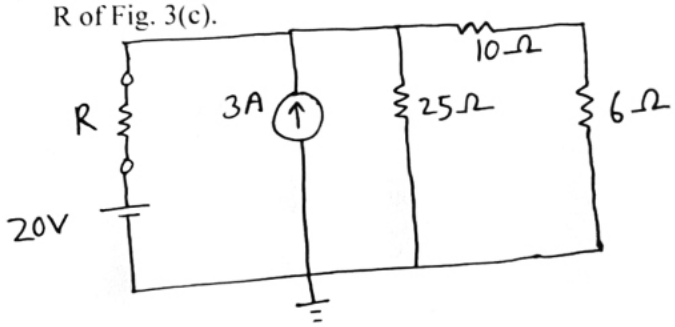

Fig. 3(c)

Q.3(d) Find the Norton equivalent circuit for the portion of the network in Fig. 3(d) external to branch a-b. 10

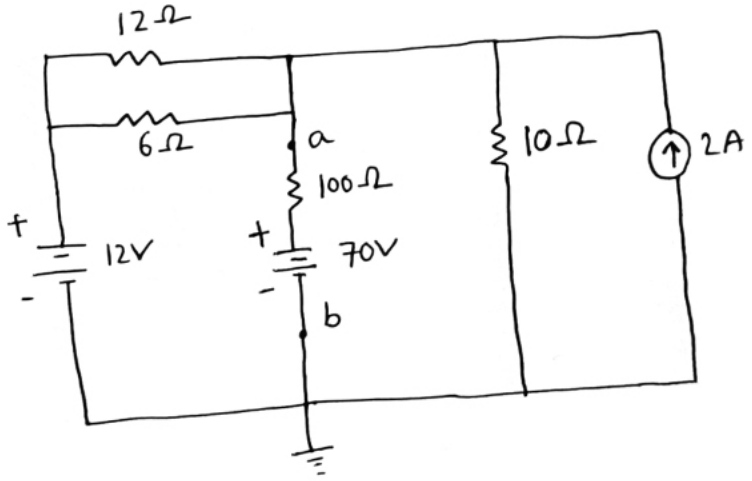

Fig. 3(d)

Section-B

Q.4(a) Find the secondary current I2 for the transformer in Fig. 4(a), If the resultant clockwise flux in the core is 1.5×10^{-5} Wb. 10

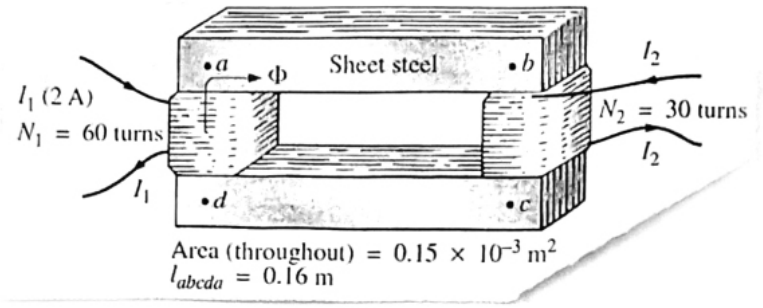

Fig. 4(a)

Q.4(b) A resistance of 10Ω is in series with a 303 μF capacitor. If the voltage drop across capacitor is 150 sin (220t-60) volts, find the equation of voltage drop across the entire circuit with respect to time. Find also the expression of current at any time t. 12.5

Q.4(c) Find the phase relationship between waveforms (phase difference and lead/lag) V=2cos (wt-30°) and $\dot{I}$=3sin (wt-60°). 05

Q.4(d) Determine the current I required to establish a flux of 1.5 X 10^{-4} Wb in the section of the core indicated in Fig. 4(d). 10

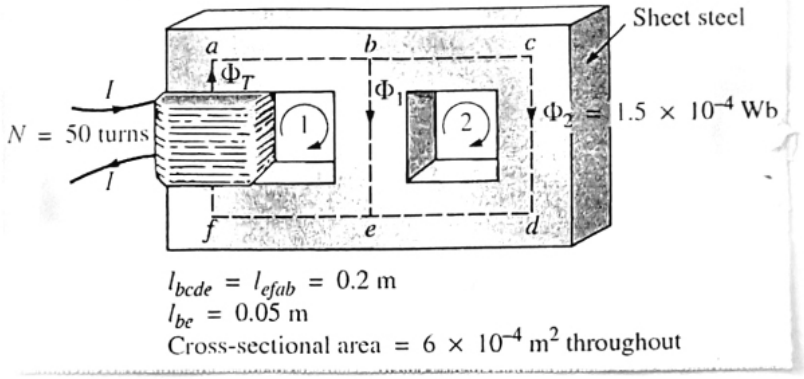

Fig. 4(d)

Q.5(a) For the circuit in Fig. 5(a) (i) Calculate I, VR, VL, and Vc in phasor form. 10
(ii) Calculate the total power factor.
(iii) Calculate the average power delivered to the circuit.

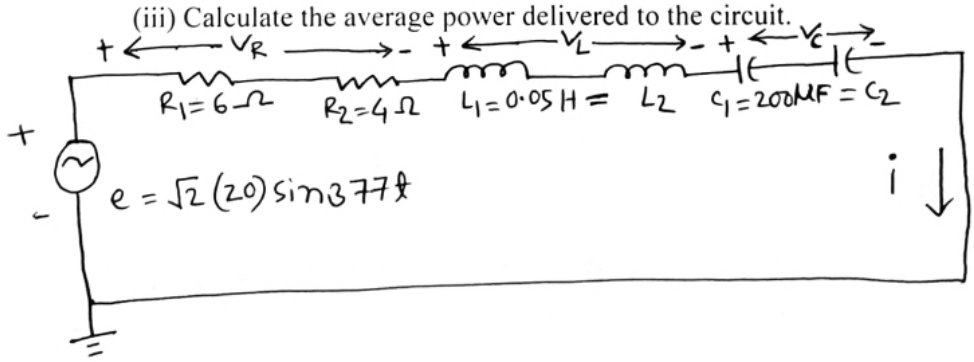

Fig. 5(a)

Q.5(b) For the parallel circuit of Fig. 5(b), find the equivalent series circuit that will have the same total impedance. 7.5

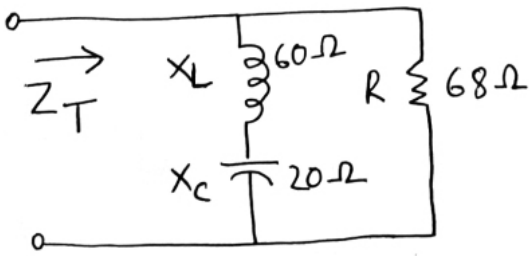

Fig. 5(b)

Q.5(c) For the circuit shown in Fig. 5(c). calculate the total impedance. compute current I. find total power factor. calculate I1 and I2. find the average power delivered to the circuit. 10

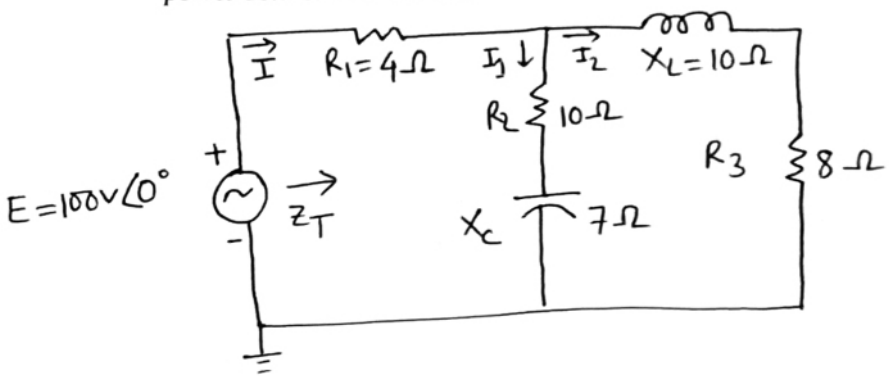

Fig. 5(c)

Q.5(d) Determine the r.m.s value for the waveform in Fig. 5(d). 10

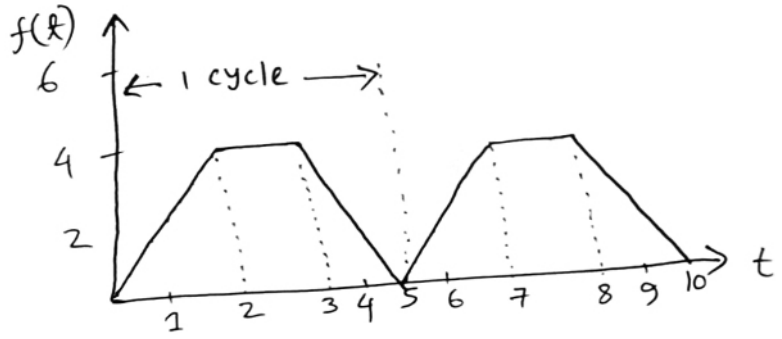

Fig. 5(d)

Q.6(a) A balance delta (Δ) load having a 20Ω resistor and 10Ω inductor in each leg is connected to a 3-phase 3-wire Y connected generator. having a line voltage of 280V. Calculate 09

(i) The phase voltage of the generator
(ii) The phase voltage of the load
(iii) The phase current of the load
(iv) The line current

Q.6(b) Calculate current. power. and power factor for each impedance Z1, Z2, Z3 as shown in Fig. 6(b). Also calculate the total current. power. and power factor of the whole circuit. 10

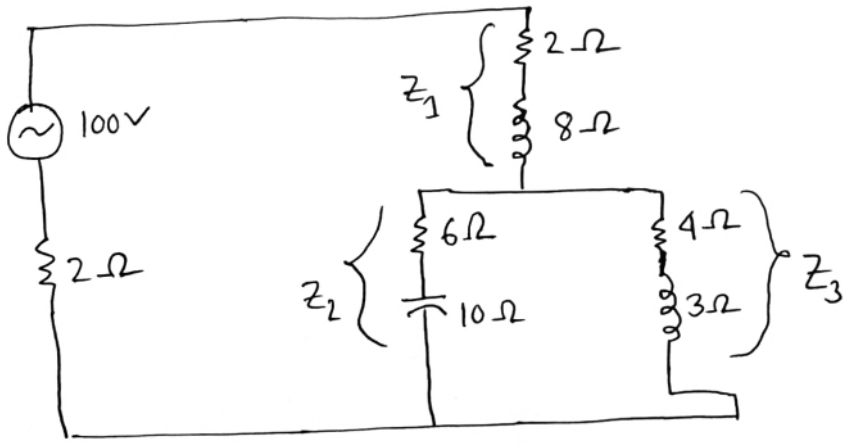

Fig. 6(b)

Q.6(c) For the circuit shown in Fig. 6(c), find the (i) value of XL and Xc at resonance. (ii) the rms value of current at resonance. (iii) the power dissipated at resonance. (iv) the power factor at resonance. 10

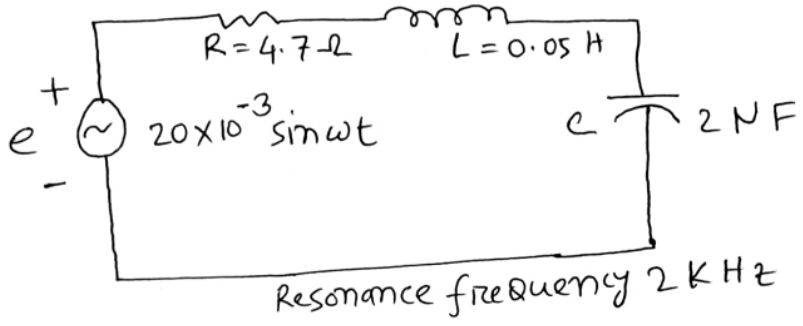

Fig. 6(c)

Q.6(d) Briefly explain the **two wattmeter method** for measuring the 3-phase power. 08½

Chittagong University of Engineering and Technology
Department of Computer Science and Engineering
B. Sc. Engineering Level-1, Term-I, Exam. 2020

Course No: Hum-141
Course Title: English
Marks: 100
Time: 2 Hours

The figure in the right margin indicates full marks. The questions are of equal value. Answer any two questions from each section. Use separate script for each section.

SECTION-A

Q.1(a) What is a sentence? Differentiate among phrase, clause and sentence. 08

Q.1(b) Form sentences by using the following sentence patterns: 06

i. Subject – Intransitive verb
ii. Subject – Linking verb – Complement
iii. Subject – verb – Object
iv. Subject – verb – Object – Complement

Q.1(C) "Pronouns can work as determiner". Do you agree with this statement or disagree? 08

Q.1(d) What is an adverb? Explain. 03

Q.2(a) Discuss the rules of using the punctuation mark comma, period and colon. 08

Q.2(b) Delineate the major word formation processes. 11

Q.2(c) Analyze the following sentence according to the structure, form and function: 06
The methods, which are used in research, are innovative in nature.

Q.3(a) "Ellen smells the cake". Here, "smell" is action verb or linking verb. Explain 06

Q.3(b) Correct the grammatical errors in the following sentences: 12

i. I am accustomed with hot weather.
ii. He is quite capable to do that.
iii. Being in haste, the door was left open.
iv. Read regularly lest you will fail.
v. Either the engineer or his mechanics has failed in his duty.
vi. Me and John are off to the circus.
vii. Bread and butter are good for health.
viii. He told me that he may come today.

Q.3(c) Write a short note on 'Participle'. 07

SECTION-B

Q.4(a) What is reading? Differentiate between skimming and scanning. 08

Q.4(b) Discuss the four stages of the writing process. 12

Q.4(c) What is critical thinking? Explain. 05

Q.5(a) Compose a paragraph on the topic of "Crimes increasing among teachers". 09

Q.5(b) What is a research paper? What are the steps of writing a research paper? 10

Q.5(c) Briefly write about modifier. 06

Q.6(a) Discuss the SQ3R reading method. 10

Q.6(b) What are the four kinds of speech delivery and which one is your favourite? 07

Q.6(c) What is the main purpose of academic writing? Elaborate argumentative and critical kinds of writing. 08

END

Chittagong University of Engineering and Technology
Department of Computer Science and Engineering
B. Sc. Engineering Level-1, Term-1, Exam. 2020

Course No: Math-141
Course Title: Differential and Integral Calculus
Marks: 150
Time: 2 Hours

The figure in the right margin indicates full marks. The questions are of equal value. Answer any two questions from each section. Use separate script for each section.

The examination is conducted according to the decision of the 135th academic council meeting of CUET

SECTION-A

Q.1(a) A function $f(x)$ is defined as follows, 16

$$f(x) = 1 + x, \quad x \le 0$$
$$= x, \quad 0 < x < 1$$
$$= 2 - x, \quad 1 \le x \le 2$$

Examine the continuity of $f(x)$ at $x = 0$ and differentiability at $x = 1$.

Q.1(b) Differentiate $\tan^{-1}\frac{x}{\sqrt{1-x^2}}$ with respect to $Sec^{-1}\frac{1}{2x^2-1}$ 11

Q.1(c) Evaluate, $\lim_{x \to \infty} (1+\frac{1}{x^2})^x$ 10.5

Q.2(a) If $y = e^{a\sin^{-1}x}$ then prove that 25

i. $(1-x^2)y_2 - xy_1 - a^2 y = 0$

ii. $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} + (n^2 + a^2)y_n = 0$

Q.2(b) Verify the Mean Value theorem for the function $f(x) = x - x^3$ in the interval [-2, 1]. 12.5

Q.3(a) If $u = \log(\tan x + \tan y + \tan z)$ prove that 12

$$(Sin\ 2x)\frac{\partial u}{\partial x} + (Sin\ 2y)\frac{\partial u}{\partial y} + (Sin\ 2z)\frac{\partial u}{\partial z} = 2$$

Q.3(b) Discuss the maximum and minimum of $u(x, y) = x^2 - xy + y^2 + 3x - 2y + 1$ 13.5

Q.3(c) Find the equation of the tangent and normal at (2, 4) to the curve $y = x^3 - 3x + 2$. 12

SECTION-B

Q.4(a) Integrate the following 24

i. $\int 3x^2\sqrt{x^3+1}\ dx$

ii. $\int \frac{3Cosx + 4Sinx}{4Sosx + 5Sinx} dx$

iii. $\int \frac{dx}{\sqrt{(x-1)(2-x)}}$

Q.4(b) Evaluate $\int_a^b Cosx\,dx$ as the the limit of a sum. 13.5

Q.5(a) Evaluate $\lim_{n \to \infty} \left[\frac{1}{n^2}\sec^2\frac{1}{n^2} + \frac{2}{n^2}\sec^2\frac{4}{n^2} + \frac{3}{n^2}\sec^2\frac{9}{n^2} + \ldots\ldots\ldots + \frac{1}{n}\sec^2 1 \right]$ 13.5

Q.5(b) Evaluate 24

i. $\int_0^4 \frac{dx}{(16+x^2)^{3/2}}$

ii. $\int_{-1}^2 xe^{6x}dx$

iii. $\int_0^{\pi} \frac{xSinx}{1+Cos^2 x}dx$

Q.6(a) Show that $\beta(m,n) = \frac{\Gamma m\,\Gamma n}{\Gamma m+n}$ 8.5

Q.6(b) By using differentiation under integral sign, evaluate $\int_0^1 \frac{x^{\alpha}-1}{\log x}dx$ given $\alpha \geq 0$. 14

Q.6(c) For the curve $x^{2/3} + y^{2/3} = a^{2/3}$ show that the volume of the solid formed by revoluation of the curve about an axis is $\frac{32}{105}a^3$ 15

END

Chittagong University of Engineering and Technology
Department of Computer Science and Engineering
B. Sc. Engineering Level-1, Term-I, Exam. 2020

Course No: Phy-141
Course Title: Physics
Marks: 150
Time: 2 Hours

The figure in the right margin indicates full marks. The questions are of equal value. Answer any two questions from each section. Use separate script for each section.

SECTION-A

Q.1(a) State the fundamental condition for the production of interference fringes. 08

Q.1(b) For both constructive and destructive interference, define an expression of phase difference due to reflected light from a plane parallel this film. 23

Q.1(c) Two straight and narrow parallel slits 1 mm apart are illuminated by monochromatic light. Fringes formed on the screen held at a distance of 100 cm from the distance are 0.50 mm apart. Calculate the wavelength of light. $6^1/_2$

Q.2(a) Show that the intensity expression for Fraunhofer double slit diffraction phenomena is $I = 4R_0^2 \frac{Sin^2\beta}{\beta^2} Cos^2\delta$, where the symbols have their usal meanings and discuss the condition for maxima and minima pattern and draw the intensity distribution for the diffraction pattern. 25

Q.2(b) Draw the resultant curve for the Fraunhofer diffraction due to double slit when $b = a$, $b = 2a$. 6.5

Q.2(c) Deduce the missing order for a double slit Fraunhofer diffraction pattern if the slits are 0.088 mm and they are 0.44 mm apart, 06

Q.3(a) Write down the fundamental postulates of quantum mechanics. 10

Q.3(b) State Heisenberg's uncertainty principle. Applying this principle find an expression for the radius of Bohr orbit. 15.5

Q.3(c) Derive an expression for one dimensional time independent Schrodinger wave equation of a free particle. 12

SECTION-B

Q.4(a) What is packing fraction? Derive expression for the pacing fraction of a S.C., b.C,C, and f.C.C crystal structure. 17.5

Q.4(b) What are Miller indices? Show that in a crystal of cubic structure, the distance between the planes with Miller indices h, k, l is equal to $d = a/\sqrt{h^2 + k^2 + l^2}$ 14

Q.4(c) The Bragg's angle for the first order reflection from (111) plane in a crystal is 30°. Calculate the interatomic spacing if X-rays of wavelength 1.76A° are used. 06

Q.5(a) Obtain an expression for the resultant displacement of a particle, which is being simultaneously acted upon by two simple harmonic vibrations of some frequency but different phase and amplitude. What happens if the two vibrations are (i) in the same phase (ii) in opposite phase? 15

Q.5(b) Two simple harmonic motion acting simultaneously on a particle are given by the equations 12.5

$Y_1 = 2Sin(wt + \pi/6)$ and $Y_2 = 3Sin(wt + \pi/3)$

Calculate (i). Amplitude (ii). Phase constant and (iii). Time period of the resultant vibration

Q.5(c) Show that the motion of a body suspended from a coil spring is simple harmonic. 10

Q.6(a) Derive the Einstein's photoelectric equation. 12

Q.6(b) Write down the laws of photoelectric effect. 08

Q.6(c) In a TV set, electron are accelerated by a P.d. of 10 kv. What is the wavelength associated with this electrons? 05

Q/6(d) What are de Brog lie matter waves? Mention the factor on which the wavelength of the particle depends. Show that $\lambda = \frac{12.25}{\sqrt{v}} A°$ where the symbols have their usual meanings. 12.5

END