L-1/T-2/ME Date : 31/03/2019

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2017-2018

Sub: **CHEM 141** (Chemistry of Engineering Materials)

Full Marks: 210 Time: 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1 (a) Give the classification of thermosetting plastics. **(6)**

(b) What are the available forms of plastics? **(6)**

(c) Write the different types of esterification reactions to form polyester. Mention the uses of polyesters. **(6+5=11)**

(d) Describe the preparation of the following plastics with reactions (any two). Mention their uses: (i) Celluloid, (ii) Epoxy resin, (iii) Polyvinylacetate. **(12)**

2. (a) Describe the properties of Fibers. **(5)**

(b) Classify the Nylon with their monomers. **(6)**

(c) What are the artificial silks? Describe the manufacturing process of viscose rayon with reactions and flow sheet. **(12)**

(d) Write short notes on the following (any two): **(12)**

(i) Polycarbonate, (ii) Spinning Methods, (iii) Cuprammonium Rayon.

3. (a) Classify raw materials of glasses into different classes. Discuss the different types of raw materials with suitable examples. **(12)**

(b) What are the differences between Pot furnace and Tank furnace? **(5)**

(c) Write the furnace reactions occurred when the batch materials are composed of salt cake, lime stone, silica and carbon. **(9)**

(d) Describe the prospect of glass industry in Bangladesh. **(9)**

4. (a) What is latex? How it is collected from plant? Write the approximate composition of latex. **(10)**

(b) Mention the basic difference between gutta percha and Hevea rubber. **(3)**

(c) What is vulcanization? What are the substances used in compounding? Mention their specific functions. **(12)**

(d) Discuss the preparation and uses of styrene-Butadiene Rubber (SBR). **(10)**

Contd P/2

CHEM 141

SECTION - B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) What is paint? How it protects a surface from environmental effects? What pigments are usually used to produce black, yellow, blue and red colored paint. **(2+4+4=10)**

(b) How corrosion can be controlled via metallic coating? **(8)**

(c) What is pitting corrosion? Which criteria are essential to assess the Pitting corrosion? **(4+6=10)**

(d) Discuss the Chemical theory of dry corrosion. **(7)**

6. (a) How chloramine process can be employed to sterilize water. Define "available chlorine" of bleaching powder. **(7+3=10)**

(b) Define foaming. How it can be prevented? **(3+5=8)**

(c) What do you mean by silica content in water? How the presence of silica in water impose detrimental effects? How it can be removed? **(2+4+4=10)**

(d) What do you mean by flocculation of water? Mention the name of two commonly used flocculants in contaminated water. **(5+2=7)**

7. (a) What are ceramic materials? Write down the characteristic behaviours of ceramics. What are the major raw materials used to produce ceramics? **(2+5+3=10)**

(b) What are the basic requirements of a good refractory material? **(8)**

(c) Discuss the following properties of a refractory material: (i) Porosity, (ii) Thermal spalling, (iii) Dimensional stability, (iv) Refractoriness under load. **(10)**

(d) How milling is done by Impact method? In which circumstances Impact crushing is most useful? **(3+4=7)**

8. (a) What is varnish? Discuss different types of varnish? Write down the characteristics features of an ideal varnish. **(2+4+4=10)**

(b) Write short notes on Piezoelectric ceramics and Nuclear ceramics? **(8)**

(c) What do you mean by flash point of lubrication and pour point of lubrication? **(10)**

(d) What is Silicon Nitride ceramics? Write down their several important applications. **(2+5=7)**

L-1/T-2/ME **Date : 06/04/2019**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2017-2018

Sub: **PHY 159** (Waves and Oscillations, Geometrical Optics and Wave Mechanics)

Full Marks: 210 Time: 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Define forced vibration. In this vibration, what is the effect of driving forced frequency on the vibration? **(7)**

   (b) If the mass of a spring m_s is not negligible but small compared to the mass M of the object suspended from it, then show that the time period of the simple harmonically oscillating spring is $T = 2\pi\sqrt{\frac{M+\frac{m_s}{3}}{k}}$, where the symbols have their usual meaning. From the above equation, mention what the effect of spring mass in the oscillation is. **(20)**

   (c) An ideal spring has force constant k, and a mass m is suspended from it. The spring is cut in half and the same mass is suspended from one of the halves. Is the frequency of the oscillation the same before and after the spring cut? How are the frequencies related? **(8)**

2. (a) What is phase velocity? Find the relation between group velocity and phase velocity. When does the group velocity become equal to the phase velocity? **(7)**

   (b) Show that in the case of stationary wave, no energy is transferred across any section of the medium. **(8)**

   (c) A string vibrates according to the equation $y = 5\ Sin\left(\frac{\pi}{4}x\right) Cos\left(30\pi t\right)$, where x and y are in centimeters and t is in seconds. (i) What is the amplitude and velocity of the component waves whose superposition can give rise this vibration? (ii) Find the distance between consecutive antinode for this vibration. **(20)**

3. (a) What are reverberation and reverberation time? What are the acoustic requirements of a good auditorium? **(7)**

   (b) What are assumptions of Sabines? Deduce expressions for the growth and decay of intensities of sound in a room. **(20)**

   (c) Find the reverberation time of a room of 6 m wide, 10 m long and 4 m high and contains 50 wooden seats. There are 50 people in the room. Absorption co-efficient of room (wall, floor and ceiling) is 0.025. Absorbing power per person = 0.3 Sabines and per wooden seat = 0.2 Sabines. **(8)**

4. (a) Deduce an expression for the magnifying power of a compound microscope. **(20)**

   (b) Derive an expression for the resolving power of a microscope. **(15)**

Contd P/2

PHY 159

SECTION - B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Show that the deviation of an incident beam of light produced by a thin lens is independent of the object position. **(10)**

(b) Deduce an expression for the distance between the principal point of equivalent lens and the first lens, when two thin lenses are placed co-axially in air and separated by a distance *d*. **(15)**

(c) The focal length of a lens in air is 10 cm. What will be its focal length if air is replaced by water? Refractive index of glass and water are $^{3}/_{2}$ and $^{4}/_{3}$ respectively. **(10)**

6. (a) What is dispersive power of a lens? Explain it is a positive quantity. Find the expression for the chromatic aberration in a lens. **(10)**

(b) Show the condition for achromatism of two thin co-axial lenses separated by a distance is that the distance between the two lenses must be equal to the mean focal length of the two lenses. **(15)**

(c) The focal length of the convex lens and the concave lens are 8 cm and 4 cm, respectively. The lenses are placed at a certain distance apart. Calculate the distance between the lenses if they form an achromatic combination. **(10)**

7. (a) Write down the required characteristics of wave function ψ. **(5)**

(b) Explain the energy eigen function for an electron that is strongly bound to its atomic nucleus. Draw schematically the wave function ψ and the probability function $\psi \times \psi$ for an electron in a bound potential well. What conclusions can be drawn from these schematic diagrams? **(20)**

(c) Derive the infinite square well energy quantization law, directly from the de Broglie relation $p = {}^{h}/_{\lambda}$, by fitting an integral number of half de Broglie wave lengths $^{\lambda}/_{2}$ into the width 'a' of the well. **(10)**

8. (a) Explain 'Quantum Mechanical Tunneling' effect and write down its important applications in Solid State Physics. **(10)**

(b) Write down the mathematical expression of the three statistical distribution functions by mentioning each term. Distinguish among them with examples. **(15)**

(c) What is Fermi energy? Find the Fermi energy in copper on the assumption that each copper atom contributes one free electron to the electron gas. The density of copper is 8.94×10^{3} kg/m^{3} and its atomic mass is 63.5 u. **(10)**

L-1/T-2/ME **Date : 10/04/2019**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2017-2018

Sub : **HUM 101** (English)

Full Marks : 210 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE** questions, including **Q. No. 1** as compulsory.

Symbols indicate their usual meaning.

1. Read the passage and answer the questions that follow: **(43)**

Students are responsible for familiarising themselves with the University Code of Student Conduct, as on enrollment with the University the student has placed themselves under the policies and regulations of the University and all of its duly constituted bodies. Disciplinary authority is exercised through the Student Conduct Committee. The Committee has procedures in place for hearing allegations of misconduct.

Academic dishonesty is never condoned by the University. This includes cheating and plagiarism, which violate the Student Conduct Code and could result in expulsion or failing the course.

Cheating includes but is not limited to obtaining or giving unauthorized help during an examination, getting unauthorized information about the contents of an examination before it is administered, using unauthorized sources of information during an examination, altering or falsifying the record of any grades, altering or supplying answers after an examination has been handed in, falsifying any official University record, and misrepresenting the facts to get exemptions from or extensions to course requirements.

Plagiarism includes but is not limited to submitting any paper or other document, to satisfy an academic requirement, which has been copied either in whole or in part from someone else's work without indentifying that person; failing to identify as a quotation a documented idea that has not been thoroughly assimilated into the student's language and style, or paraphrasing a passage so closely that the reader could be misled as to the source; submitting the same written or oral material in different courses without obtaining authorization from the lecturers involved; or 'dry-labbing', which includes obtaining and using experimental data from fellow students without the express consent of the lecturer, utilizing experimental data and laboratory write-ups from other parts of the course or from previous terms during which the course was conducted, and fabricating data to fit the expected results.

Questions:

(a) What, according to the passage, is academic dishonesty?

(b) What, according to the passage, is the definition of cheating? Write in your own words, do not copy from the passage.

Contd P/2

HUM 101(ME)

Contd... Q. No. 1

(c) What, according to the passage, is the definition of plagiarism? Write in your own words, do not copy from the passage.

(d) What are possible consequences of cheating and plagiarism?

(e) What is university code of student conduct?

(f) Why does a university formulate student code of conduct?

2. (a) What are the essential elements of a business letter? **(10)**

(b) Suppose you are serving as a Mechanical Engineer in the Chittagong plant of PROTON (a Malaysian automobile manufacturer). You have received written complaints from a buyer for some technical lapse of a manufactured car delivered from your plant. Give a suitable reply and turn his/her frown into smile. **(10)**

(c) Write phonetic transcription of the following words: **(ANY FIVE)** **(10)**

Father, happy, actual, yes, pure, about.

3. (a) Briefly discuss Front Matter of a Report. **(10)**

(b) Write a paragraph on any one of the following topics: **(10)**

(i) Alternative Energy

(ii) A Spring Day

(iii) Reducing Emphasis on Grades in Our Education System

(c) Write a dialogue between two BUET students on stress and anxiety of term final examination. **(10)**

4. (a) Transform the following sentences as directed: **(ANY FIVE)** **(10)**

(i) We sat under the tree and discussed the matter among ourselves. (Simple)

(ii) Increase physical activities and you will have good health. (Simple)

(iii) She found the lost child and became crazy. (Complex)

(iv) At the time of raining during the weekend we indulged in chit-chat. (Complex)

(v) If you are proficient in English, you will get easier access to the world of knowledge. (Compound)

(vi) Despite being a diligent student, his grades are not satisfactory. (Compound)

(b) What are the principles of letter writing? **(5)**

(c) Write short notes on **(ANY THREE)** of the following: **(15)**

(i) Diphthongs

(ii) Terminator of a Paragraph

(iii) Back Matter of a Report

(iv) Sending Quotation

Contd P/3

HUM 101(ME)

SECTION –B

There are **FOUR** questions in this section. Answer any **THREE** questions, including **Q. No. 5** as compulsory.

5. (a) Explain with reference to the context any two of the following: **(15)**

(i) "There aren't any grown-ups. We shall have to look after ourselves".

(ii) After a good deal of haggling the other agreed.

(iii) 'It's what causes you to have money. If you're lucky you have money."

(b) Answer any one of the following: **(15)**

(i) Orwell produces several arguments in favour of shooting the elephant, and several argument for not shooting it. What are they? Which, according to you, are the most convincing?

(ii) Is "The Rocking-House Winner" a critique of the obsession with materialism in modern times?

(c) Answer any three of the following: **(15)**

(i) Why did Orwell find himself hated by large numbers of people?

(ii) Describe the island where the children landed on after the plane crash.

(iii) What are the Astrologer's strategies to win more customers?

(iv) What does Orwell say about the dead Dravidian coolie?

(v) How is Guru Nayak defeated twice by the Astrologer?

6. (a) Recast and correct any ten of the following sentences: **(15)**

(i) Rima prevented Tomal to go there.

(ii) No less than eighty people attended the concert.

(iii) Rumana, I and you will join the party tomorrow.

(iv) Our travel to India was pleasant.

(v) They bought many furnitures for their new house.

(vi) One of the students of our class have got a prize in music competition.

(vii) Tania excels to speak Spanish.

(viii) If he learnt English well he will get a scholarship.

(ix) It was Mitul who he wanted to come.

(x) That fruit vender has plenty of clients.

(xi) The mangoes of Rajshahi are better than Dhaka.

(xii) The police has caught a smuggler.

(b) Give meanings of and make sentences with any ten of the following words: **(15)**

Alluring, Baffle, Castigate, Deride, Equivocal, Falter, Germinate, Hubbub, Lustrous, Menace, Palatable, Retort.

Contd P/4

HUM 101(ME)

7. Amplify the idea in any one of the following: **(30)**

   (i) Hope for the best, but prepare for the worst.

   (ii) A calm sea does not make a skilled sailor.

8. Write a précis of the following: **(30)**

It's really surprising how social networking sites can be exploited to breach user data and to target consumers where it initially began with a motive to connect people. Most of the users, regardless of their geographical location, use social media entertainment while being completely oblivious about the usage of the personal data they're sharing. Trends like # throwback Thursday, #flashback Friday and #10yearchallenge took social media giants unprecedentedly this year. People are posting photos or using photo collage apps to post photos comparing the one taken in 2019 with a photo from 2009. People from all around the world have participated in this challenge which was also trending as the "grow up challenge" or "2009 vs 2019 challenge". Other critics like Professor Amy Webb of Stern School of Business characterized the 'photo challenge' as "a perfect storm for machine learning," for Facebook. Webb, who has authored an upcoming book about how artificial intelligence can manipulate humans, told CBS News that this challenge "... Presented Facebook with a terrifying opportunity to learn and to train their systems to better recognize small changes in users' appearances". This led many to believe that Facebook intentionally started the campaign to develop its AI for face recognition which they have been working on for quite a while now. For machine learning, it is crucial to input a rigorous amount of data in context for which Facebook might have started the challenge in order to get relatively accurate information of how people look now versus 10 years back. In many cases, people added further information like time and place which made things more precise. Facebook however denied any involvement in generating the trend. "This is a user-generated meme that went viral on its own. Facebook did not start this trend, and the meme uses photos that already exist on Facebook. Facebook gains nothing from this meme (besides reminding us of the questionable fashion trends of 2009). As a reminder, Facebook users can choose to turn facial recognition on or off at any time," it said on Twitter. But if Facebook is using photos that already exist on its platform, why did they start the campaign in the first place? Kate O'Neil, the writer of the wired article explained that the existence of the images on Facebook's system does not mean that Facebook will not benefit from a mass participation from users essentially categorizing the data for the company. "Sure, you could mine Facebook for profile pictures and look at posting dates or EXIF data. But that whole set of profile pictures could end up generating a lot of useless noise. People don't reliably upload pictures in chronological order, and it's not uncommon for users to post pictures of something other than themselves as a profile picture. A quick glance through my Facebook friend's profile pictures shows a friend's dog who just died, several cartoons, word images, abstract patterns, and more," O'Neil wrote. This gives Facebook a robust amount of accuracy with the obtained data and the users participating in the challenge helps with this tremendously.

L-1/T-2/ME **Date : 10/04/2019**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2017-2018

Sub: **HUM 103** (Economics)

Full Marks: 210 Time: 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

Symbols indicate their usual meaning.

1. (a) What do you understand by localization of industries? What are the main causes of localization of industries? Explain them in brief. **(15)**

   (b) Explain the advantages and disadvantages of localization of industries. **(20)**

2. (a) What are the determinants of price elasticity of demand? **(10)**

   (b) How would you measure price elasticity of demand at any point on a straight line demand curve? Explain graphically. **(15)**

   (c) From the following table calculate elasticity of demand if you move from point A to C and explain what you understand from the result. **(10)**

POINT	Px	Qy
A	1500	150
B	1600	180
C	1700	210

3. (a) What is an indifference curve? Explain the properties of an indifference curve. **(15)**

   (b) Define budget line and budget set. **(10)**

   (c) From the following budget line and the utility function, calculate the amount of two commodities that maximizes satisfaction. What is the maximum amount of satisfaction? **(10)**

$$5000 = 45X + 55Y$$
$$U = 500X^{0.6}Y^{0.7}$$

4. (a) Show that price is determined in an economy under competition by the intersection of demand and supply. What will happen to the price and quantity due to simultaneous change in demand and supply? Explain graphically. **(15)**

   (b) From the following demand and supply functions, calculate equilibrium price and quantity and show the result in a graph. **(20)**

$$P = 0.20\,Q + 10$$
$$P = -0.40\,Q + 70$$

   (i) What will happen to the equilibrium price and quantity if government imposes a unit tax of TK 5 per unit?

   (ii) What will happen if government gives a subsidy of TK 10 per unit?

   (iii) Describe the change in equilibrium. Show the equilibrium coordinates on the same graph.

Contd P/2

HUM 103

SECTION - B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Define total, average and marginal cost. Why does marginal cost increase as output increase? **(5)**

(b) Fill the gaps on the table below **(15)**

Quantity (q)	Total cost	variable cost	Fixed cost	Average Total cost	Average fixed cost	Average variable cost	Marginal cost
5						6	10
6	85						
7				15			
8					5		25
9		120					

[Hint: marginal cost of q(6) = total cost of q(6) – total cost of q(5)]

(c) Draw average cost (AC) and marginal cost (MC) from above table (in question b) and discuss the relationship between the AC and MC. **(15)**

6. (a) Discuss the characteristics and explain profit maximization of a perfectly competitive firm graphically. What type of profit will sustain in this market in long-run and why? **(15)**

(b) Why monopoly arises in the market? Show the equilibrium of monopoly market graphically and explain. **(15)**

(c) Explain deadweight loss of monopoly market. **(5)**

7. (a) Explain the concept of nominal GDP and real GDP. Which one gives more precise understanding of national income and why? **(5)**

(b) Calculate nominal and real GDP form the given information and compare the growth rates for both calculation of GDP. **(15)**

Output	2014		2015		2016	
	P_{15}	Q_{15}	P_{16}	Q_{16}	P_{17}	Q_{17}
A	40	300	60	190	50	350
B	100	200	150	200	160	250
C	900	150	1000	160	900	180
D	400	70	300	85	350	120

(c) Explain the reasons of inflation and describe the Phillips curve. **(15)**

8. (a) Suppose, $Y = C + I + G$; $C = 150 + 0.6Y_d$; $I = 3000$; $G = 2000$; $T = 1500$.

Given the information provided answer the following questions: **(3×5=15)**

(i) Solve Y and C for the economy

(ii) What will be the amount of public and private savings in this economy?

(iii) What will happen to Y and C if the "marginal propensity to consume" is 0.8, explain.

(b) What is CPI? What are the differences between CPI and GDP deflator? Explain the calculation process of CPI. **(10)**

(c) Explain the quantity theory of money. **(10)**

L-1/T-2/ME Date : 25/03/2019

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2017-2018

Sub : **ME 171** (Computer Programming Language)

Full Marks: 210 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Mention the limitations of Bit Field Operator in C Programming. Using Bit Field Operator, write down a C program to store and print the time currently showing in your watch in the following format in most memory efficient way. **(10)**

Hour:Minute:Second (For example: 23:11:57)

(b) Consider a structure **'employee'** in C having two members: a string named **'name[20]'** and an int named **'salary'.** Now, these members are required to be passed to a user defined function **'display()'** in which number of parameters to be passed can be adjusted accordingly. You have to write the function call statement, function definition to pass the structure in the user defined function and the body statements to print that information in the output console from function body by passing structure pointer to the function. **(8)**

(c) Mention two key advantages of File based Input/Output system over Console based Input/Output system. Write down a C program that will read the students ids and respective gpa of 2 terms of 180 students placed side by side in three columns from a file named **"ME_L1_T2.txt"** and calculate the average cgpa of each student to include them in the **4th column of the same file.** **(17)**

2. (a) In C, the type char stores 8 bits of binary data. It is possible to hold small integer vales (in the range -128 to +127) in a variable of char type. Let, x and y are 2 (signed) char variables. They are respectively initialized with values 47 and -115. Write down the following: **(10)**

(i) bit pattern (binary representation) of (x & y)

(ii) bit pattern (binary representation) of (x ^ y)

(iii) decimal value of ~x and

(iv) decimal value of ~y

(b) Write a C program that takes two integers (a and b) as input from user and swaps (interchanges) their values and print them in the output console. **A third variable can't be used and you can use assignment operators only.** **(7)**

Contd P/2

ME 171

Contd... Q. No. 2

(c) **"Which one is more preferable method of programming- Procedural Programming or Object Oriented Programming?"**- answer with a specific reason for your choice. Then, write a class in Python called **'Student'** which will have two public variables: One string named **name[20]'** and another integer type **'credits_earned'**. The class will also have a public method called **'year'** which uses the name and credits_earned of the 'student' type objects to rank them as a Freshman (0-36), a Sophomore (37-72), a Junior (73-108), a Senior (109-160) or a Graduate (equal to 161) based on their credits_earned, print the name and the rank of the objects. Create an object of 'Student' type and initialize the object with name and credits_earned. Finally print the name and rank of the object. [For example, if the name is "Sam" and the credits_earned is 161 then the output should be "Sam is a Graduate."] **(18)**

3. (a) Write down a Python script that can detect whether a point is inside or outside a rectangle. The rectangle's sides are parallel to the axes of the XY plane. Your inputs are (x, y) coordinates of 3 points (assume integers coordinates). The first 2 points respectively represent the top left and bottom right corners of the rectangle. The 3rd input point is query point. Print "Inside the rectangle" if the query point is inside or on the boundary of the rectangle. Otherwise, print "Outside the rectangle". **(10)**

(b) Write down the outputs of the following commands placed in Python Shell: **(10)**

```
>>> a=[2,4,6, 'Apple',[4,6,8]]
>>> a=[-20:-4]
Output1:
>>> a.append([6,8,10])
>>> a[5].reverse()
Output2:
>>> a.index('Apple')
Output3:
>>> a.insert(4,2)
>>> a[1:-1]
Output4:
>>> a[5].insert(1,2)
>>> a[5]
Output5:
```

(c) Show a flowchart for finding greatest common divisor (gcd) f two integers. Then, write down a user defined function in Python using the algorithm that will take two integers from the user and print their gcd to the output console. **(15)**

4. (a) Write down a C program that will take a positive integer n as input and display a pyramid of caret (^) enclosed by asterisk (*). The pattern that needs to be displayed for n =5 is shown in the Figure for Question no. 4(a). **(12)**

Contd P/3

ME 171

Contd... Q. No. 4(a)

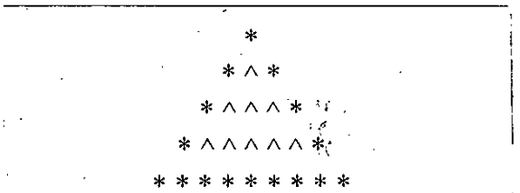

Figure for Question no. 4(a)

(b) Write a C preprocessor macro **min2(a, b)** that finds out the minimum of a and b. Now write another C preprocessor macro **min4(a, b, c, d)** that finds out the minimum of a, b, c and d using **min2** macro. **(8)**

(c) Write down the output of the following code segments: **(15)**

(i)
```
#include<stdio.h>
#define square(x)  x*x
#define cube(x)    x*x*x
int main()
{                              // Precedence of ( ) is from Left to Right
  printf("%4d", square(cube(3+3)));
  printf("\n%04d", square((cube(3+3))));
  return 0;
}
```

(ii)
```
#include<stdio.h>
void iterate(int, int);
int main()
{
  int i, x=10, a=5;
  for(i=1;i<=3;i++)
    iterate(x,a);
}
void iterate(int c, int d)
{
  static int e=0;
  c++;
  e = e+d;
  printf("%d\t%d\n",c,e);
  return 0;
}
```

(iii)
```
#include<stdio.h>
const int z=7;
int x=10,y=12;
int main()
{
  int y= x++;
  int x= ++y;
  int z= 8;
  z+=2;
  printf("%3d\n%05d\n%+2d", x++, ++y, z);
  return 0;
}
```

Contd P/4

ME 171

SECTION - B

There are **FOUR** questions in this section. Answer any **THREE**.

Assume any data if necessary. Symbols used have their usual meaning

5. (a) Differentiate between (i) Microprocessor and Microcontroller, (ii) Neumann architecture and Harvard architecture, (iii) CISC CPU and RISC CPU, (iv) Single-core CPU and Multi-core CPU. **(16)**

(b) Define 'computing platform' with examples. Why is the concept of computing platform' essential for a computer programmer? **(10)**

(c) Discuss the compatibility issues between 32-bit and 64-bit computing systems especially considering CPUs and OSs. **(9)**

6. (a) Classify variables in C based on their scope and lifetime. **(8)**

(b) Describe how the following code will be executed by the CPU during runtime from start to finish (exit): Mention line numbers and use imaginary memory locations (rectangular boxes) for the variables in your description. **(15)**

```
Line-1:   # include <stdio.h>
Line-2:   int f1(int *x)
Line-3:   {
Line-4:         return *x*=1;
Line-5:   }
Line-6:   int main()
Line-7:   {
Line-8:         int y = 10, z = 20;
Line-9:         y = f1(&z);
Line-10:        printf("y = %d\tz = %d", y, z);
Line-11:        return 0;
Line-12:  }
```

(c) Write a C program which will ask for your birthday (day, month and year) from console and calculate your age today. If your age is less than or equal to 35 years then it prints "You are eligible", otherwise prints "You are not eligible" to the console. **(12)**

7. (a) Given the following declaration: **(9)**

```
float fn[][3][2]={1.1, 2.2, 3.3, 4.4, 5.5, 6.6, 7.7, 8.8, 9.9, 10.10,
                  11.11, 12.12};
```

Assuming the address of the first element (variable) in memory as '1234', list all the elements of the array with their addresses in memory, proper indices along with their assigned values.

(b) Write a C program which will get the weights of a number of persons in an age-group from the console and print the average weights of the group in the console. The program should first ask for the number of persons from the console, dynamically allocate memory accordingly and then proceed to get the weights. **(12)**

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Contd... Q. No. 7

(c) Write a C program which will receive ten words from the keyboard and then arrange the words in dictionary order. The program should also print the time elapsed to sort the words. **(14)**

8. (a) Make a text file containing application serial number as 1 to 10 in one column and their corresponding four-digit (any number) application form numbers in another column. Then write a C program which will randomly select three students for admission based on their serial number and print their serial and form numbers in two adjacent columns of another text file. Also show the sample output file. **(12)**

(b) Show how to create a multi-file C program with examples. **(10)**

(c) Illustrate with examples how one can create and distribute user library of functions in C. Also show how a user can use the functions in the library in his/her program. **(13)**

L-1/T-2/ME **Date : 14/03/2019**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2017-2018

Sub : **MATH 163** (Integral Calculus and Differential Equations)

Full Marks: 280 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. Workout the following: **(16+16+14⅔)**

(a) $\int \frac{dx}{(3x+5)\sqrt{2x^2-5x+1}}$ (b) $\int \frac{3x+2}{4x^2+5x+3}$ (c) $\int \frac{2\sin x-3\cos x}{4\sin x+3\cos x}dx$

2. (a) Evaluate: **(15)**

$$\lim_{n\to\infty}\left[\left(1+\frac{1}{n}\right)\left(1+\frac{2}{n}\right)\left(1+\frac{3}{n}\right).....\left(1+\frac{n}{n}\right)\right]^{\frac{1}{n}}$$

(b) Obtain a reduction formula for $\int \sin^p x\cos^q x dx$ and then use the formula to evaluate $\int \sin^3 x\cos^2 x dx$. **(17⅔)**

(c) (i) Evaluate: $\int_0^\infty x^2 e^{-2x^2} dx$. **(8)**

(ii) Test for convergence the series whose n^{th} term is $\frac{2^n}{n^3}$. **(6)**

3. (a) Find the area between the cissoid $y^2 = \frac{x^3}{2a-x}$ and its asymptote. **(15)**

(b) Use Simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rules to evaluate $\int_0^1 \frac{dx}{1+x^2}$. Hence obtain the value of π in each case. **(16⅔)**

(c) Find the perimeter of the hypo-cycloid $\left(\frac{x}{a}\right)^{2/3}+\left(\frac{y}{b}\right)^{2/3}=1$. **(15)**

4. (a) Find the area within the lemniscate $r^2 = 2a^2\cos 2\theta$ and outside the circle $r = a$. **(14)**

(b) Determine the intrinsic equation of the cardioide $r = 4(1-\cos\theta)$, being measured from the cusp. **(15)**

(c) The loop of the curve $3ay^2 = x(x-a)^2$ revolves about the x-axis. Find the volume and surface area of the solid generated. **(17⅔)**

Contd P/2

MATH 163

SECTION - B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Find the differential equation of all conics whose axes coincide with co-ordinate axes. **(15)**

(b) Solve the following differential equations:

(i) $(2x-5y+3)dx-(2x+4y-6)dy=0$ **(16⅔)**

(ii) $\frac{dx}{dy}+(2x\tan^{-1}y-x^3)(1+y^2)=0$ **(15)**

6. (a) Check whether the differential equation $(2y+3xy^2)dx+(x+2x^2y)dy=0$ is exact or not. If not, then reduce it into exact form and hence solve. **(15)**

(b) A tank 4 ft. deep has a rectangular cross-section 6′×8′. The tank is initially filled with water, which runs out through an orifice of radius 1″ located in the bottom of the tank. Find: **(16⅔)**

(i) the time required for the tank to empty.

(ii) the height of water in tank 20 minutes after it starts to drain out.

(c) Find the complete as well as the singular solutions of the differential equation $p=In(px-y)$, where $p=\frac{dy}{dx}$. What are the physical properties of this equation? **(15)**

7. (a) Find complementary function and particular integral of $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+y=x\sin x$. **(15)**

(b) Solve the Cauchy-Euler's differential equation: **(16⅔)**

$$(x+1)^2\frac{d^2y}{dx^2}+(1+x)\frac{dy}{dx}+y=\sin 2\{\ln(1+x)\}.$$

(c) Solve the differential equation: $y\frac{d^2y}{dx^2}-\left(\frac{dy}{dx}\right)^2=y^2\ln y$. **(15)**

8. (a) Using variation of parameter method, solve $y''+y=\sec^2 x$. **(15)**

(b) A circuit has in series an electromotive force of $100\sin 60t$ volts, a resistor 2 ohms, an inductor 0.1 henry, and a capacitor of 1/260 farads. If the initial current and charge on the capacitor are both zero, find the charge on the capacitor at any time $t>0$. **(16⅔)**

(c) Using the method of factorization of operator, find the solution of $xy''+(x+2)y'-2y=x^3$. **(15)**

L-1/T-1/ME **Date : 01/10/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B.Sc. Engineering Examinations 2017-2018

Sub : **EEE 159** (Fundamentals of Electrical Engineering)

Full Marks: 210 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) The circuit in Figure for Q.1a contains a variable resistance, R, implemented using a potentiometer. The resistance of the variable resistor varies over the range $0 \leq R \leq 1000\Omega$. The variable resistor can safely receive 1/4 W power. Determine the maximum power received by the variable resistor. Is the circuit safe? **(20)**

   (b) Determine the value of the equivalent resistance R_{eq} and current I in the circuit shown in Figure for Q.1b. **(15)**

2. (a) Find the Thevenin equivalent circuit in Figure for Q.2a using source transformation. **(15)**

   (b) Find the power absorbed or supplied by element 1 and the dependent source for the circuit in Figure for Q. 2b. **(20)**

3. (a) Use the superposition principle to find i_o and v_0 in the circuit of the Figure for Q.3a. **(15)**

   (b) Use nodal analysis to find current I_0 in the circuit of the Figure for Q.3b. **(20)**

4. (a) Solve the circuit of the Figure for Q.4a to calculate v_1, v_2, v_3. Which method should you choose and justify your choice. **(15)**

   (b) Use mesh analysis to determine V_0 in the circuit of the Figure for Q.4b. **(20)**

SECTION - B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Current $i(t)$ shown in Fig for Q. 5(a) flows through a resistor 10 ohms. Find I_{avg} and I_{rms}. Also find the form factor and crest factor. Find the average power absorbed by the resistor. **(18)**

Contd P/2

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Contd... Q. No. 5

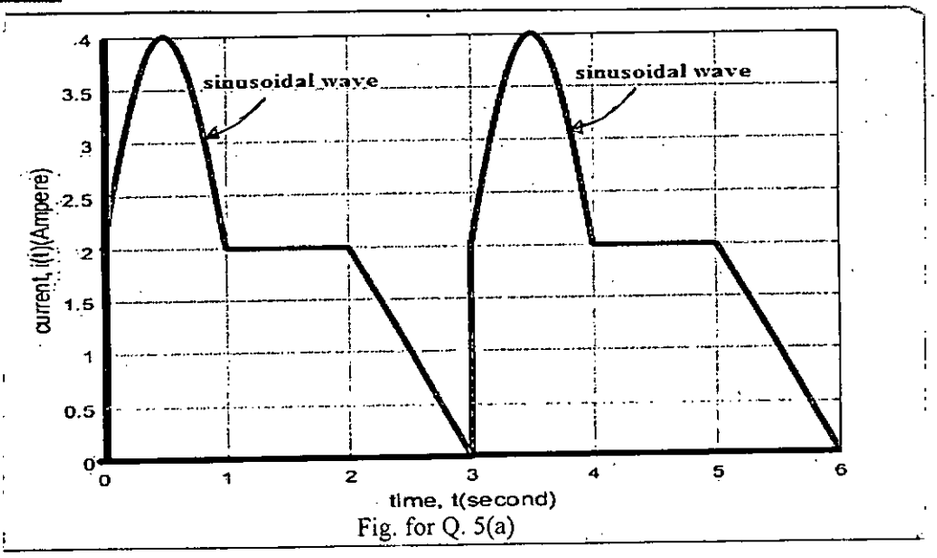

Fig. for Q. 5(a)

(b) Find the unknown reactive circuit component in Fig. for Q.5(b) which makes the power factor of the source unity. **(12)**

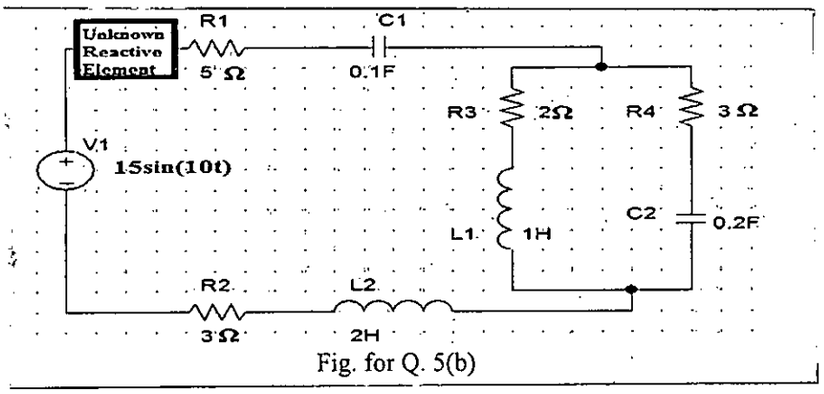

Fig. for Q. 5(b)

(c) Find the voltage $v(t)$ in a circuit described by the following equation: **(5)**

$$2\frac{dv}{dt}+5v+10\int v\,dt = 50\cos\left(5t-30^{\circ}\right).$$

6. (a) In the circuit in Fig. for Q.6(a), find the value of R_L that will absorb the maximum average power. Calculate the power. **(14)**

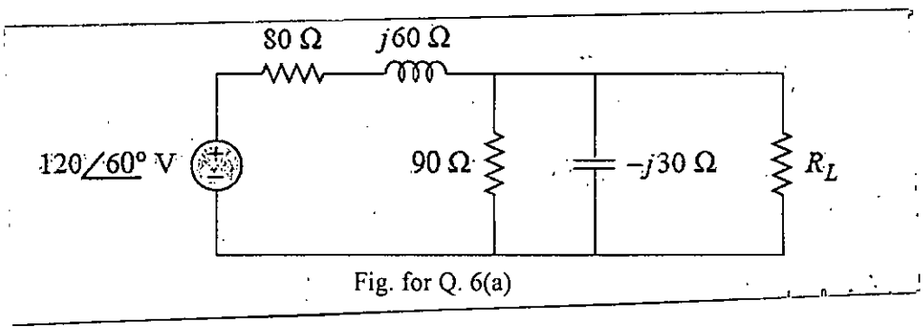

Fig. for Q. 6(a)

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Contd... Q. No. 6

(b) Find the line currents and the phase currents of the loads in the three-phase balanced circuit of Fig. for Q.6(b). Assume the *abc* sequence. **(13)**

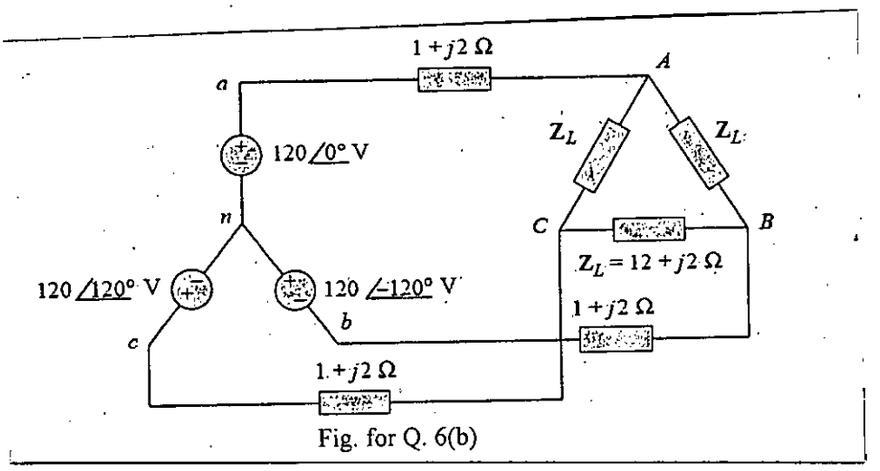

Fig. for Q. 6(b)

(c) When connected to a 120V (rms), 60 Hz power line, a load absorbs 10kW at a lagging power factor of 0.75. Find the value of capacitance necessary to raise the pf to 0.95. **(8)**

7. (a) Two balanced loads are connected to 240 kV rms 60 Hz line, as shown in Fig. for Q. 7(a). Load 1 draws 50 kW at a power factor of 0.6 lagging, while load 2 draws 60 kVAR at a power factor of 0.8 lagging. Assuming the *abc* sequence, determine: (i) the complex, real and reactive powers absorbed by the combined load, (ii) the line currents, (iii) the kVAR rating of the three capacitors Δ-connected in parallel with the load that will raise the power factor to 0.9 lagging and (iv) the capacitance of each capacitor. **(20)**

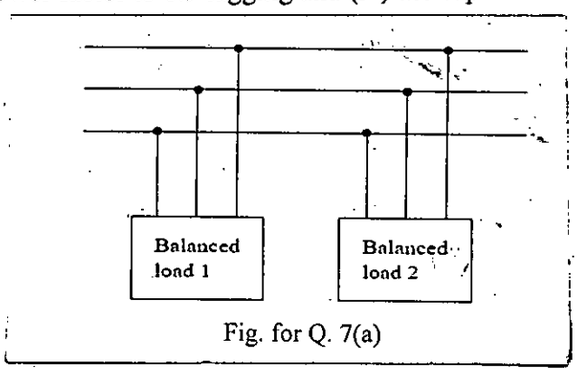

Fig. for Q. 7(a)

(b) Show that, for both Y and Δ-connected system, the total real power supplied by the 3-phase source is $3V_pI_p\cos\theta$ where, V_p = Phase voltage, I_p = Phase current and θ is the phase difference between phase current and corresponding phase voltage. **(10)**

(c) Draw the phasor diagram for the line voltages and phase voltages in a Y connected load assuming the *abc* sequence. Take V_{an} as the base of the diagram. **(5)**

8. (a) In the circuit in Fig. for Q.8(a), find the current i (t) using superposition theorem. In this circuit, V2 is a DC source and V1 is an AC source. **(16)**

Contd P/4

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Contd... Q. No. 8(a)

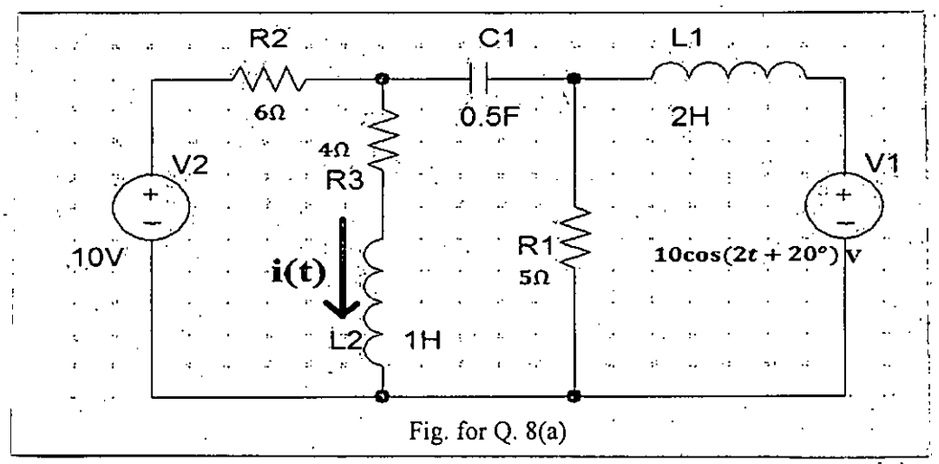

Fig. for Q. 8(a)

(b) The laminated sheet steel section of Fig for Q.8(b) (i) has a stacking factor of 0.9. Compute the current required to establish a flux of $\Phi = 1.4 \times 10^{-4} Wb$. Neglect fringing. Here, 1 *inch* = *2.54cm*. Use the graph of Fig for Q. 8(b) (ii) for finding out necessary parameters. **(19)**

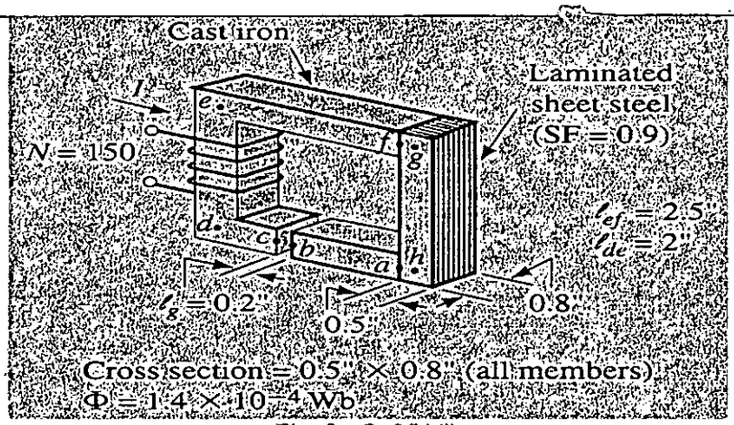

Fig. for Q. 8(b)(i)

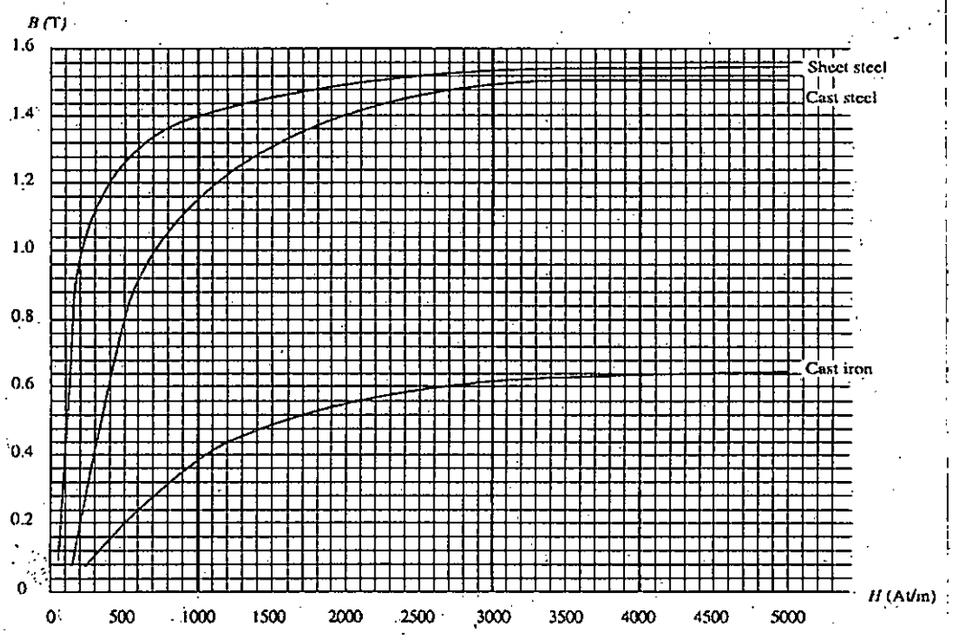

Fig. for Q. 8(b)(ii)

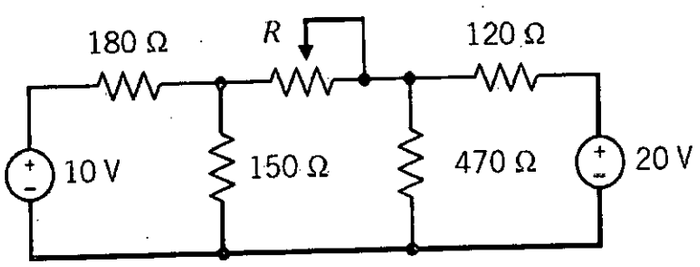

Figure for Q.1a

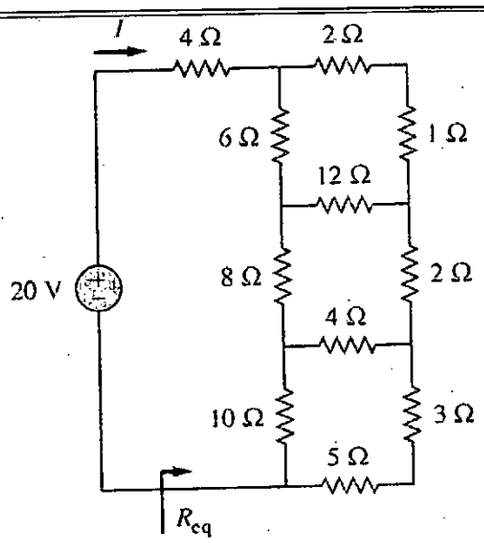

Figure for Q.1b

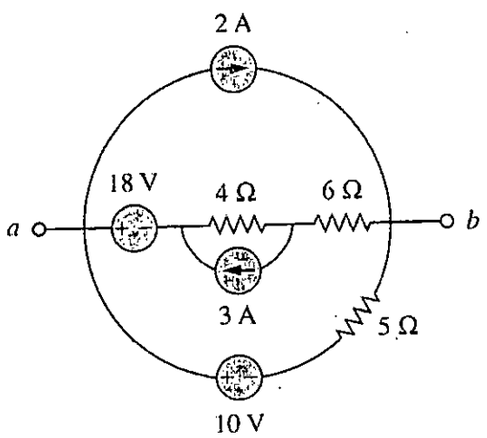

Figure for Q.2a

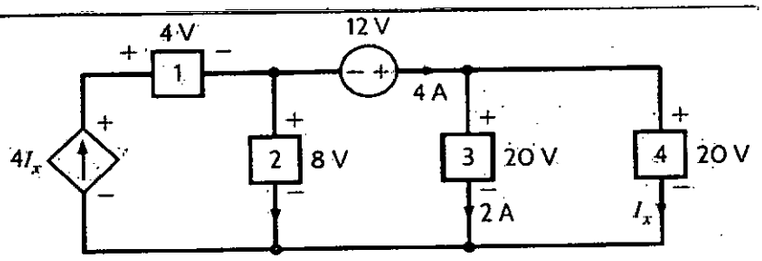

Figure for Q.2b

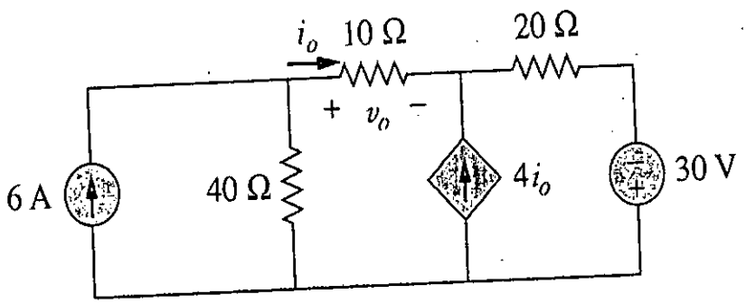

Figure for Q.3a

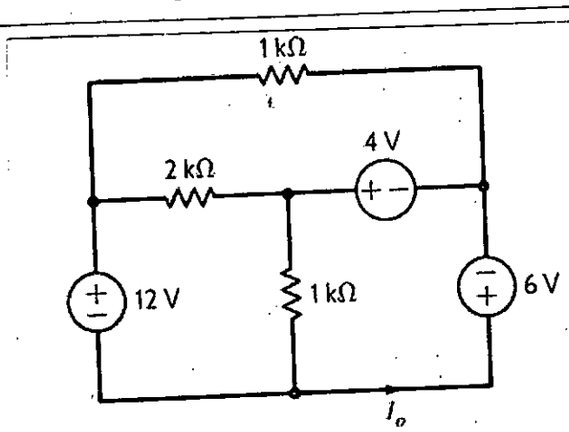

Figure for Q.3b

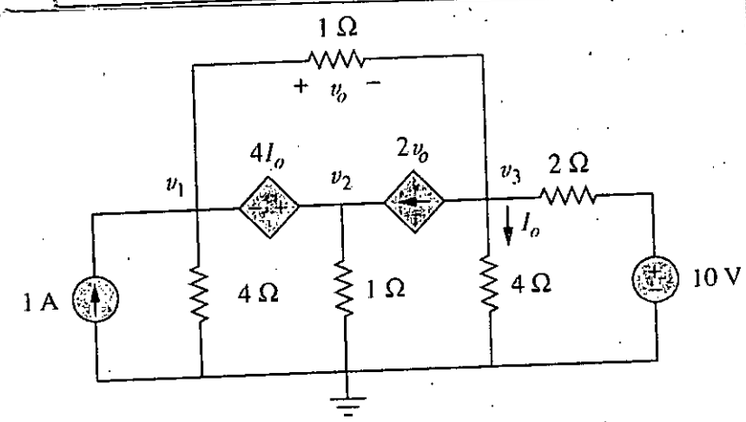

Figure for Q.4a

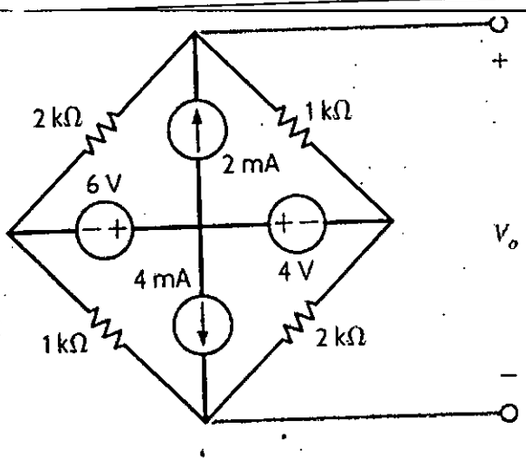

Figure for Q.4b