L-1/T-1/EEE **Date : 12/07/2011**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B. Sc. Engineering Examinations 2009-2010

Sub : **PHY 121** (Thermal Physics, Optics and Waves and Oscillations)

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**.

1. (a) Explain the terms: isothermal process, adiabatic process, isochoric process and isobaric process. **(10)**

   (b) Define specific heats at constant volume and at constant pressure. Prove that $C_p - C_v = R$, where the symbols have their usual meanings. **(17)**

   (c) The density of oxygen at normal pressure and a temperature of 27°C is 1.28 kg/m^3. Its specific heat at constant pressure is 1050 J/kg – K. Calculate (i) the gas constant per kg of oxygen and (ii) the specific heat of oxygen at constant volume. **(8)**

   (Given, density of Hg = 13.6×10^3 kg/m^3, g = 9.8 m/s^2)

2. (a) Discuss reversible and irreversible processes. **(8)**

   (b) Obtain expressions for the work done in each cycle of operation in a cannot engine and the net work done in a complete cycle. **(17)**

   (c) A Carnot engine whose low temperature reservoir is at 17°C has an efficiency of 55%. It is desired to increase the efficiency to 75%. By how many degrees should the temperature of the high temperature reservoir be increased? **(10)**

3. (a) State and explain the second low of thermodynamics. **(10)**

   (b) Deduce Clausius-Clapeyron's equation for the rate at which the vapour pressure must change with temperature for the two phases to co-exist in equilibriums; **(15)**

$$\left(\frac{\partial p}{\partial T}\right)_{sat} = \frac{L}{T\left(v_{vap} - v_{liq}\right)}$$

   Where the symbols have their usual meanings.

   (c) Calculate the change in melting point of ice at 0°C when the pressure is increased by 2 atmospheres. (given, L = 80 cal/g, specific volumes of water and ice are respectively 1.0001 c.c. and 1.0908 c.c. and 1 atmosphere = 1.013×10^6 dynes/cm^2). **(8)**

4. (a) What is diffraction of light? Distinguish between Fresnel and Fraunhofer type of diffraction. **(10)**

   (b) Describe the Fraunhofer diffraction pattern produced by a single slit illuminated by monochromatic light and find an expression for the width of the central maximum. **(18)**

   (c) A convex lens of focal length 20 cm is placed after a slit of width 0.6 mm. If a plane wave of wavelength 6000 Å falls on the slit normally, calculate the separation between the second minima on either side of the central maximum. **(7)**

Contd P/2

PHY 121(EEE)

SECTION – B

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

5. (a) What are the conditions to get sustained interference pattern? **(5)**

   (b) Deduce an expression for the intensity of light at a point due to superposition of wave coming from two light source. Hence, find the conditions of constructive and destructive interference. **(18)**

   (c) Show that energy is conserved in interference phenomena. **(6)**

   (d) A parallel beam of light of wave length λ = 5890 Å is incident on a glass plate (μ = 1.5) such that the angle of refraction into the plate is 60°. What should be the minimum thickness of the glass slate which would make the plate dark in reflected light? **(6)**

6. (a) Distinguish between polarized and unpolarized light. **(4)**

   (b) Define 'optic axis', O-ray and E-rany in connection with double refraction of light. **(6)**

   (c) What is a Nicol prism? Describe the construction and working principle of a Nicol prism and how the Nicol prism can be used as polarizer and an analyzer. **(19)**

   (d) Unpolarized light falls on two polarizing sheets placed one top of the other. What must be the angle between their characteristic directions if the intensity of transmitted light is one third of intensity of the incident beam? **(6)**

7. (a) What are Lissajous figures? Deduce an expression for the resultant vibrations. **(14)**

   (b) What are phase velocity and group velocity? Show that for a non-dispersive medium phase velocity and group velocity are the same. **(15)**

   (c) A particle is acted upon by two oscillations and the resultant figure is a circle. The equation of one oscillation is x = 4 Cos 15 t **(6)**

   (i) What will be the another equation?

   (ii) If the phase difference between the oscillations is zero and $\pi/4$, what will be the resultant figures?

8. (a) Derive the differential equation of one dimensional simple harmonic oscillator. **(12)**

   (b) Obtain expressions for energy density and intensity of a plane progressive wave. **(17)**

   (c) A musical instrument of frequency 250 Hz is sending out waves of amplitude 10^{-3} cm. Find the energy density and intensity of sound. Given the velocity of sound = 332 m/sec. and density of air = 1.29 kg/m^3. **(6)**

L-1/T-1/EEE Date : 25/07/2011

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B. Sc. Engineering Examinations 2010-2011

Sub : **MATH 157** (Calculus I)

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**.

Symbols have their usual meanings.

1. (a) Consider the function **(27)**

$$f(x)=\begin{cases}\sqrt{x+\frac{1}{4}}, & -\frac{1}{4}\le x<0\\ \left|x-\frac{1}{2}\right|, & 0<x\le 1\\ \frac{3}{2}x-1, & x>1\end{cases}$$

(i) Using definition find the points, if any, at where f is not continuous.

(ii) Find $f'(x)$

(iii) Find the area under the curve f(x) using geometric formula over [0, 2]. Also sketch the graph of f(x).

(b) Find $\lim\limits_{x\to e}(\ln x)^{\frac{1}{1-\ln x}}$ **(8)**

2. (a) State Mean Value Theorem. Find the value of c at which the tangent line to the graph of $f(x) = x^3 - 4x$ is parallel to the secant line joining the points $(-2, f(-2))$ and $(1, f(1))$. **(8)**

(b) Evaluate $\dfrac{d^n}{dx^n}\left(e^x \ln x\right)$ **(14)**

(c) Expand $\tan^{-1} x$ in a finite series in powers of x with remainder in Lagrange's form. Then extend the series, if possible, to infinity within a valid region. **(13)**

3. (a) A rectangular plot of land is to be fenced using two kinds of fencing. Two opposite sides will use heavy-duty fencing selling for \$3 a foot, while remaining two sides will use standard fencing selling for \$2 a foot. What are the dimension of the rectangular plot of greatest area that can be fenced in at a cost of \$6000? **(12)**

(b) If $u = x^n F\left(\dfrac{y}{x},\dfrac{z}{x}\right)$, then find the value of $x\dfrac{\partial u}{\partial x}+y\dfrac{\partial u}{\partial y}+z\dfrac{\partial u}{\partial z}$ in terms of u. **(13)**

(c) What is the degree of *tanu* considering it as a homogeneous function, where $u=\cos\dfrac{x+y}{\sqrt{x}+\sqrt{y}}$. Verify Euler's Theorem for *tanu* and hence find the value of $x\dfrac{\partial u}{\partial x}+y\dfrac{\partial u}{\partial y}$. **(10)**

Contd P/2

MATH 157(EEE)

4. (a) Find the equation of circle of curvature at the point $\theta = \pi/2$ on the cycloid $x = a(\theta + \sin\theta)$, $y = a(1 - \cos\theta)$. **(10)**

(b) Find the length of the tangent at any point on the curve $x^{2/3} + y^{2/3} = c^{2/3}$. Also find the pedal equation of the curve. **(5+8)**

(c) Find the area of the triangle formed by the asymptotes of the curve. **(12)**

$x^2(x - 3) - y^2(4x + 12) + 12xy + 8x + 2y + 4 = 0$

SECTION – B

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

5. Workout the following:

(a) $\int \frac{1}{x^{3/2}(a+bx)^{5/2}}dx$, (b) $\int \frac{1}{a\sin x + b\cos x}dx$ (c) $\int \frac{1}{1+\sqrt{x^2+2x+2}}dx$ **(12+12+11)**

6. (a) Find the reduction formula for $\int \frac{x^n}{\sqrt{ax^2+bx+c}}dx$,

and hence evaluate $\int \frac{x^3}{\sqrt{2x^2+3x+1}}dx$ **(20)**

(b) Evaluate $\int_{\pi/12}^{\pi/6} \sec^2 2x\, dx$ by the process of summation. **(15)**

7. (a) Show that $\int_0^{\pi/2} \log\sin x\,dx = \int_0^{\pi/2} \log\cos x\,dx = \frac{\pi}{2}\log\frac{1}{2}$. **(11)**

(b) Prove that $\int_0^{\infty}\left(\frac{e^{-2x} - e^{-x}}{x} + \frac{3}{2}e^{-2x} - \frac{1}{2}e^{-x}\right)\frac{dx}{x} = -1 + \frac{1}{2}\log 2$. **(12)**

(c) Find the area common to the Cardioide $r = a(1 + \cos\theta)$ and the circle $r = \frac{3}{2}a$, and also the area of the remainder of the Cardioide. **(12)**

8. (a) Find the volume generated by the revolution of the area enclosed by $y = 4 - x^2$, $y = 0$ about the x – axis. **(15)**

(b) Find the volume and the surface area of the solid of revolution of the lemniscate $r^2 = a^2 \cos 2\theta$ about the initial line. **(20)**

L-1/T-1/EEE **Date : 01/08/2011**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B. Sc. Engineering Examinations 2010-2011

Sub : **MATH 159** (Calculus II)

Full Marks : 210 Time : 3 Hours

The figures in the margin indicate full marks.

Symbols have their usual meaning.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

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

1. (a) If $|z + ia| = |z + ib|$ then show that $z - \bar{z} = -i(a + b)$ where a and b are real numbers and z is a complex number. **(9)**

   (b) If $|z_1| = 13$ and $z_2 = 3 + 4i$, find the greatest and the least value of $|z_1 + z_2|$. **(9)**

   (c) Show that $\sin^{-1}(\operatorname{cosec}\theta) = \frac{\pi}{2} + i\ln\left(\cot\frac{\theta}{2}\right)$. **(9)**

   (d) Find all the roots of $\sin z = \cosh 4$. **(8)**

2. (a) Derive necessary and sufficient conditions for f(z) to be analytic. Test the analyticity of the function $W = e^{z^2}$. **(18)**

   (b) Show that the function $u(x, y) = (x - 1)^3 - 3xy^2 + 3y^2$ is harmonic. Find its harmonic conjugate and the corresponding analytic function f(z) in terms of z. **(17)**

3. (a) State and prove Laurent's theorem. Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in a Laurent series valid for $|z| > 3$. **(20)**

   (b) Find the bilinear transformation which maps $z = 1, i, -1$ respectively onto $W = i, 0, -1$. For this correspondence find the image of $|z| = r$ $(r > 1)$. **(15)**

4. (a) Determine the residues of the function $f(z) = \frac{z^3}{(z-1)^5(z-2)(z-3)}$ at those singular points which lie inside the circle $|z| = 2.5$. **(18)**

   (b) Evaluate $\int_C \frac{z^4 \sin z}{4z^2 - 1}\,dz$ where C is the circle $|z| = 1$. Also evaluate the integral taking C as $|z| = \frac{1}{4}$. **(17)**

Contd P/2

MATH 159

SECTION – B

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

5. (a) If two forces $\underline{P}$ and $\underline{Q}$ acting on a particle at O have a resultant $\underline{R}$ and any transversal cuts their lines of action at A, B and C respectively, prove that **(10)**

$$\frac{|\underline{P}|}{OA} + \frac{|\underline{Q}|}{OB} = \frac{|\underline{R}|}{OC}.$$

(b) Show that the vectors $\underline{i} - \underline{j} + \underline{k}$, $\underline{j} + \underline{k} - \underline{i}$ and $\underline{i} + \underline{j} + \underline{k}$ are linearly independent. Express $2\underline{i} - 3\underline{j} + 4\underline{k}$ as a linear combination of above vectors. **(15)**

(c) By vector method, obtain the perpendicular distance of the point (5, 5, 5) from the line through the points (3, 4, – 1) and (1, 3, 1). **(10)**

6. (a) Define space curve. Find the curvature and the torsion of the space curve **(13)**

$$\underline{r} = a\cos u\,\underline{i} + a\sin u\,\underline{j} + bu\,\underline{k}$$

(b) Find the equations of the tangent line and the normal plane of the curve $x^2 + y^2 + z^2 = 1$, $x + y + z = 1$ at (1, 0, 0). **(12)**

(c) Prove that $\operatorname{div}\left\{\frac{f(r)\,\underline{r}}{r}\right\} = \frac{1}{r^2}\frac{d}{dr}\left\{r^2 f(r)\right\}$, where $\underline{r} = x\underline{i} + y\underline{j} + z\underline{k}$. **(10)**

7. (a) Show that $\underline{F} = 3x^2y\,\underline{i} + (x^3 + 2yz)\,\underline{j} + y^2\,\underline{k}$ is a conservative force field. Find the amount of work done in moving an object in this field from (1, –2, 1) to (3, 1, 4). **(14)**

(b) Evaluate $\iint_S \underline{F}\cdot\underline{n}\,dS$, where $\underline{F} = 2x^2\underline{i} - y^2\underline{j} + 4xz\underline{k}$ and the region S is in the first octant bounded by $y^2 + z^2 = 9$, $x = 0$, $x = 2$. **(14)**

(c) Prove that $\int \underline{F}\cdot\underline{n}\,dS = -4\pi\int\rho\,dv$ when $\underline{F} = \nabla f$ and $\nabla^2 f = -4\pi\rho$. **(7)**

8. (a) State Stoke's theorem and verify it for $\underline{F} = (2y + z,\ x - z,\ y - x)$ taken over the triangle ABC cut from the plane $x + y + z = 1$ by the coordinate planes. **(20)**

(b) State and prove Gauss's divergence theorem. **(15)**

L-1/T1/EEE **Date : 08/08/2011**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B. Sc. Engineering Examinations 2010-2011

Sub : **CSE 109** (Computer Programming)

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**.

Every Question in this section is related to C Language.

1. (a) Write some differences between signed and unsigned data type. Can these qualifiers be applied to double or float? **(5)**

(b) Calculate the expression a + b – (c + d)*3%e+f/9 where a = 8, b = 4, c = 2, d = 1, e = 5, f=20 **(5)**

(c) Explain the bitwise right shift operator. Write a function rightrot (x, n) that returns the value of the integer x rotated to the right by n bit positions. **(5+10=15)**

(d) What will be the output of the following code? Explain. **(10)**

```
void main ()
{
    int i  = 3 ;
    i++ ;
    printf ("Multiplication is %d", i ++ * i++)
}
```

2. (a) What do you mean by local, global and static variable? What are the differences between variable declaration and variable definition? **(6+4=10)**

(b) Explain what will be the output of the following code? **(5)**

```
# include < stdio.h >
void main ()
{
    int k = 10 ;
    switch (k % 2)
    {
        case 0 : k + = 2 ;
        case 1 : k = 0 ;
        case 5 : k = 1 ;
    } ;
    printf  (" k = % d" , k) ;
}
```

(c) Write a C language program to enter n elements in an array and find the second smallest number from the array. You cannot use more than one loop to do this. **(15)**

(d) Rewrite the following code with do-while loops only. **(5)**

```
for (i = 1 ; i  < = 5; i++)   {
    for (j = 1 ; j < = i ; j++)
        printf ("%i",i);
    printf ("\n") ;
}
```

Contd P/2

3. (a) An Armstrong number of three digits is an integer such that the sum of the cubes of its digits is equal to the number itself (e.g. $153 = 1^3 + 5^3 + 3^3$). Write a C language program to print all Armstrong numbers between 1 and 999. **(10)**

(b) Write a C program to read n integer numbers in an array and split the array into two parts even and odd such that the even part contains all the even numbers and the other is odd. Use dynamic memory allocation so that no memory is wasted. **(15)**

(e.g. Original array is 7, 9, 4, 6, 5, 3, 2, 10, 18

Odd array is 7, 9, 5, 3

Even array is 4, 6, 2, 10, 18)

(c) Explain the output of the following code: **(10)**

```
# include < stdio.h >
# include < string.h >
void main ()
{
    int a, b, c, d;
    char  *p = ( char  *) 0;
    int *q = (int *q) 0;
    float *r = (float *) 0;
    double *s = (double *) 0;
    a = (int) (p+1) ;
    b = (int) (q+1) ;
    c = (int) (r+1) ;
    d = (int) (s+1) ;
    printf ("%d %d %d %d", a, b, c, d) ;
}
```

4. (a) What will be output when you will execute following C code? **(5)**

```
# include < stdio.h >
void main ()
{
    char data [2] [3] [2] = {0, 1, 2, 3, 4, 5, 6,7, 8, 9, 10, 11} ;
    printf ("%o", data [0] [2] [1]) ;
}
```

(b) Write a reverseword(char *s) function, which takes a string as input, detects each word and reverses each word leaving blanks intact. The function should return the resultant string's pointer. **(15)**

(c) Predict the output of following program. What does the following function fun do in general? **(15)**

```
# include < stdio.h >


int fun (int a , int b)
{
    if (b == 0)
        return 0 ;
```

Contd P/3

CSE 109
Contd ... Q. No. 4(c)

```
        if (b % 2 == 0)
            return fun (a + a, b/2);

        return fun (a + a, b/2) + a;
    }
    int main ( )
    {
        printf ("%d", fun (4, 3)) ;
        getchar ( ) ;
        return 0 ;
    }
```

SECTION –B

There are **FOUR** questions in this Section. Answer any **THREE**.
Questions 5 to 7 are related to C++ and Question 8 is related to C.

5. (a) Create and initialize a 2d array of objects for the following class definition. Assume the array size is 4 by 2. **(10)**

```
class box{
    float l, h, w ;
public:
    box(float l, float h, float w) {
    this -> l = l
    this – > w = w ;
    this – > h = h ;
    }
};
```

(b) What are the advantages of using new-delete over malloc-free for dynamic memory allocation? **(10)**

(c) What is the problem of the following code fragment? Suggest a way to solve the problem. **(8)**

```
char &index (int i){
    char ch[10] ;
    if(i > = 0 && i < 10)
        return ch[i];
}
```

Contd P/4

CSE 109
Contd … Q. No. 5

(d) Assume that the following Stack class simulates the basic properties of stack mechanism. **(7)**

```
class Stack{
    int *s; //represents elements of the stack
    int top; //indicates the top of the stack
public:
    //related member functions goes here
};
```

write a copy constructor for this class.

6. (a) **(20)**

```
class Complex{
    int real; //represents real part of complex number
    int imaginery; //represents imaginery part of complex number
public:
    //required member functions goes here
};
```

The above Complex class represents a data type for complex numbers. Overload the < and * operators relative to the given class using both member and friend functions. [Assume a complex number, a + bi is less then another complex number c + di iff $\text{sqrt}(a^2 + b^2) < \text{sqrt}(c^2 + d^2)$. And $(a + bi) * (c + di) = ac - bd + (ad + bc)i$]

(b) A, B, C and D are four classes with following properties and relationship among them. **(12)**

class A{	class B : public A{	class C : private A{	class d: protected A{
int ax;	int bx;	int cx;	int dx;
protected:	protected:	protected:	protected:
int ay:	int by;	int cy;	int dy;
public:	public:	public:	public:
int az;	int bz;	int cz;	int dz;
};	};	};	};

Write down which of the following statements in main function are valid and which are invalid.

void main (){	oa.ay = 6;
A oa;	oc.az = 10;
B ob;	od.az = 15;
C oc;	oc.cz = 9;
D od;	od.dz = 12;
ob.ay = 5;	oa.bz = 7;
ob.az = 3;	}

CSE 109
Contd … Q. No. 6.

(c) What happens if you want to create an object of a class whose constructors are declared as it's private members? **(3)**

7. (a)

```
class person{
    char *name;
    int age;
public:
    //add constructor and destructor
};
//write junior function
```

Do the following for person class **(5+4+7+8=24)**

(I) Define a constructor which takes a string (to initialize name) and an integer (to initialize age) as its parameter.

(II) Define a destructor which frees the memory allocated for name.

(III) Write a non member function **junior** which takes two person type object as parameter and returns the object which has smaller age.

(IV) What possible problems can happen if you pass person type objects to junior and return a person type object from **junior**.

(b) **(6)**

```
class limousine{
    int speed;
public:
    friend compare (limousine a, corolla b);
};
class corolla{
    int speed
public:
    friend compare(limousine a, corolla b);
};
```

What is the problem with above class definitions? Suggest a way to solve the problem?

(c) The C++ standard library contains these three functions. **(5)**

```
double atof(char *s);
int atoi(char *s);
long atol(char *s);
```

These functions return the numeric value contained in the string pointed to by s. Specifically, atof returns a double value, atoi returns an integer value and atol returns a long double value. Why is it not possible to overload these functions?

Contd ………. P/6

CSE 109

8. (a) Write a C program that copies the contents of one file into another file in reverse order. You are not allowed to use any array, string for the manipulation of the file content. **(12)**

   (b) Write a C program which will do the following: **(4+3+6+5+5=23)**

   (I) Define a structure named **soldier** with properties: **name** (character array), **id** (integer) and **hall**. Here, **hall** is another user defined data type with properties: **name** (character array) and **establishment** (integer). Give the definition of **hall** also.

   (II) Declare a local and global variable for **soldier** data **type**.

   (III) From the following table assign 1st column information into the local variable and 2nd column information into the global variable:

Name	Potter		Patel
id	2134		5268
hall	name	Griffindor	Revenclaw
	establishment	1860	1875

   (IV) Define a function which will write all the information of the local and global variables into a file.

   (V) Define a function which will read the above mentioned file and show the information in user screen.

L-1/T-1/EEE **Date : 19/07/2011**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 B. Sc. Engineering Examinations 2010-2011

Sub : **EEE 101** (Electrical Circuits -I)

Full Marks: 210 Time : 3 Hours

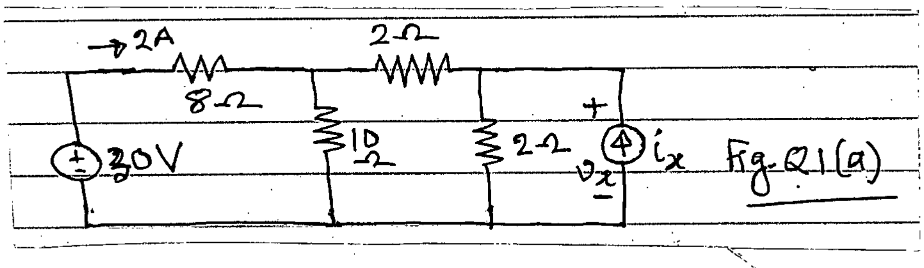
The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

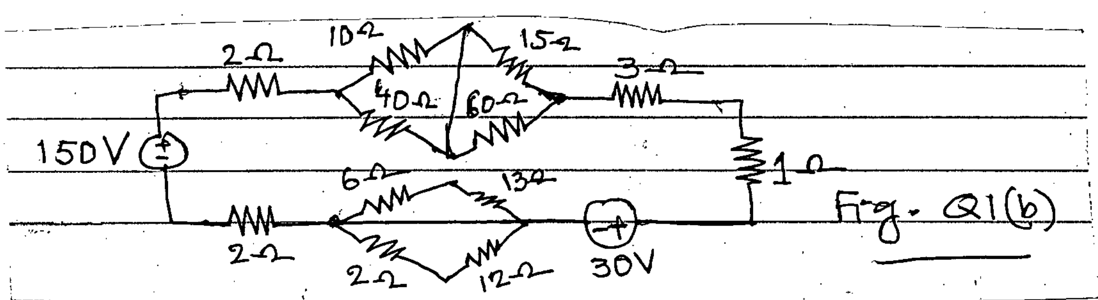
SECTION – A

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

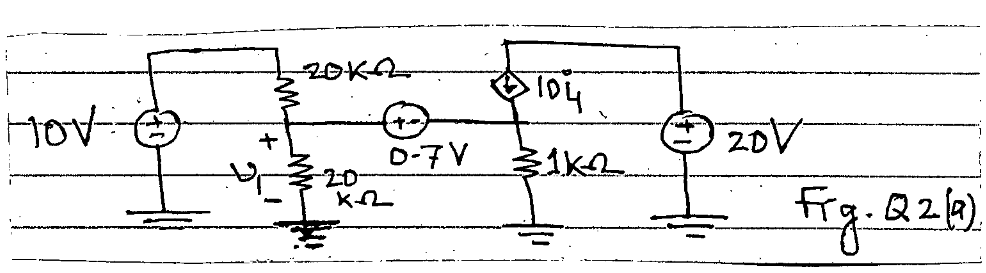
1. (a) Determine v_x in the circuit of Fig. Q. 1(a). **(20)**



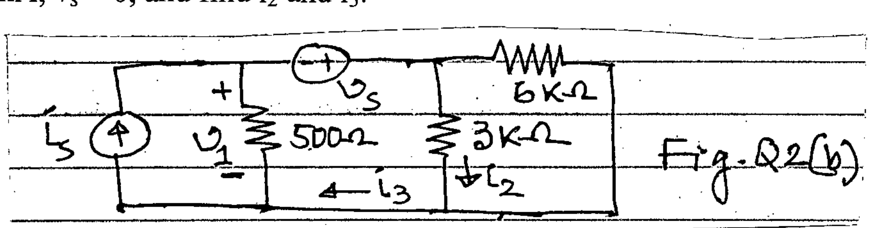
(b) Use both resistance and source combinations, as well as, current division, in the circuit of Fig. Q. 1(b) to find the power absorbed by the 1–Ω resistor. **(15)**



2. (a) Find v_1 of the circuit shown in Fig. Q. 2(a). Explain why voltage division cannot be used to determine v_1. **(15+5=20)**

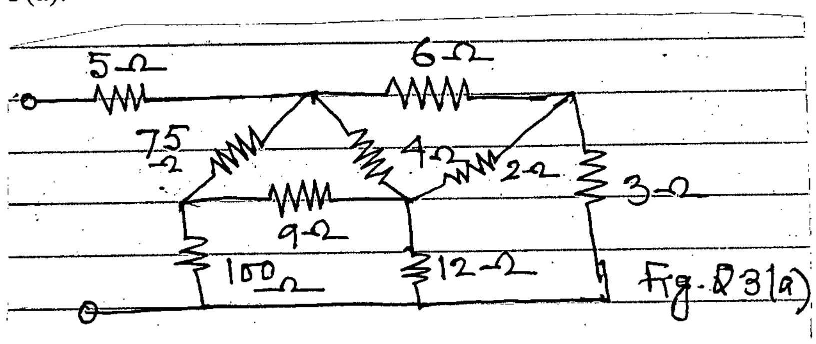


(b) With reference to the circuit shown in Fig. Q. 2(b): (i) let $v_s = 40$ V, $i_s = 0$, and find v_1; (ii) $i_s = 3$ mA, $v_s = 0$, and find i_2 and i_3. **(15)**

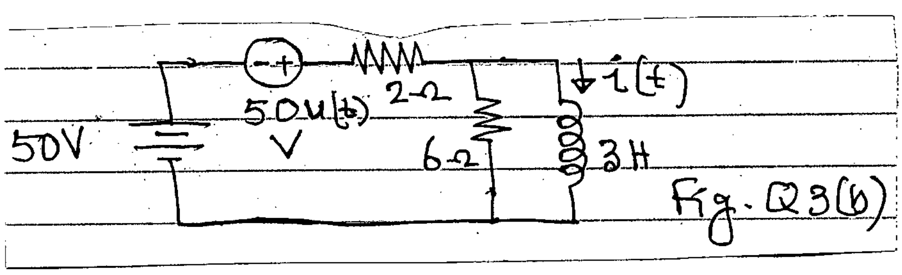


EEE 101

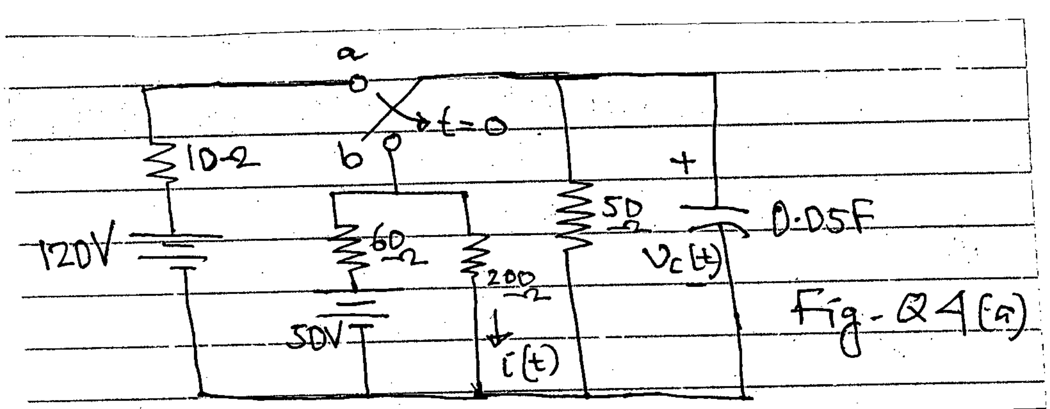
3. (a) Use Y–Δ and Δ–Y transformations to find the input resistance of the network shown in Fig. Q. 3(a). **(15)**



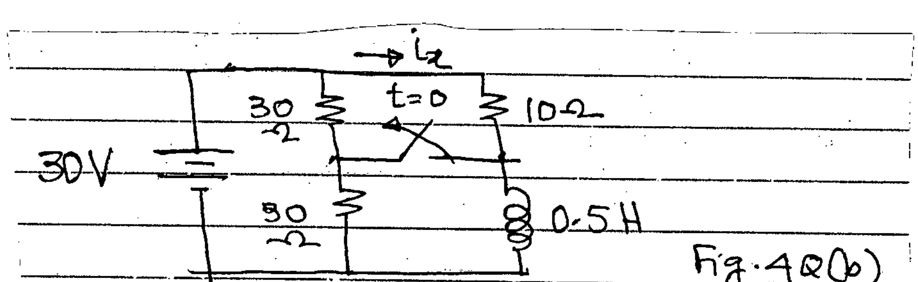
(b) Determine i(t) for all values of time in the circuit of Fig. Q. 3(b). **(20)**



4. (a) Find the capacitor voltage $v_c(t)$ and i(t) in the 200 Ω resistor of Fig. Q. 4 (a). **(20)**



(b) Assume that the switch in Fig. Q 4(b) has been closed for a long time and then opens at t = 0. Find i_x at t equal to 0^- ; 0^+ and 40 ms. **(15)**



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SECTION – B

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

5. (a) Using mesh analysis, find the value of v_o in the circuit shown in Fig. for Q. 5(a). **(17)**

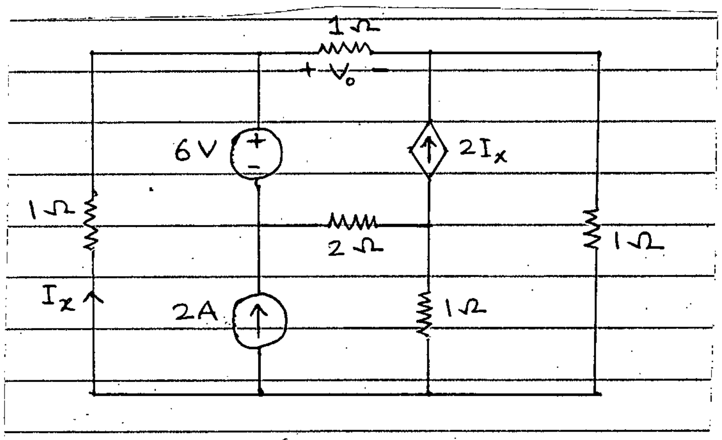

Fig. for Q. 5(a)

(b) Using nodal analysis, find the power developed by the 20 V source in the circuit shown in Fig. for Q. 5(b). **(18)**

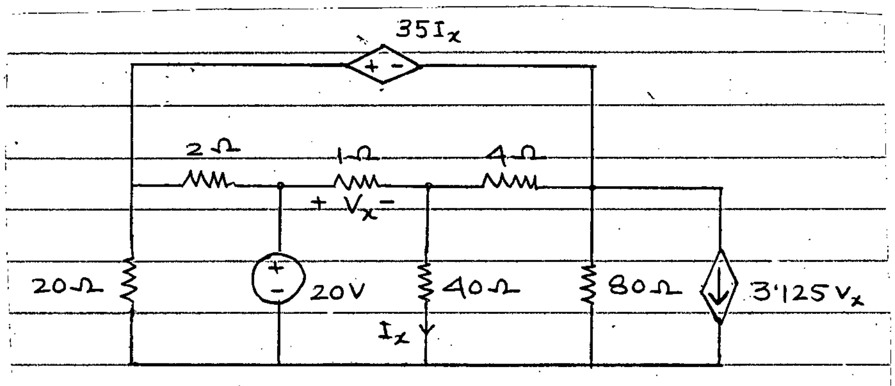

Fig. for Q. 5(b)

6. (a) Find the value of R for maximum power transfer to R in the circuit shown in Fig. for Q. 6(a). Also calculate the maximum power delivered to R. **(17)**

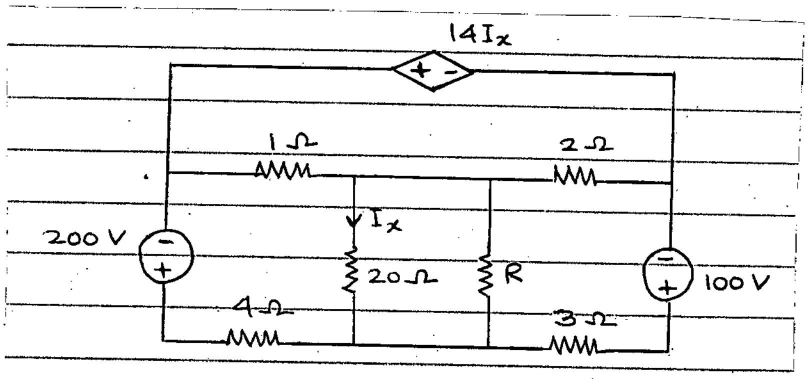

Fig. for Q. 6(a)

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Contd ... Q. No. 6

(b) Using principle of superposition, find the value of v_0 in the circuit shown in Fig. for Q. 6 (b). **(18)**

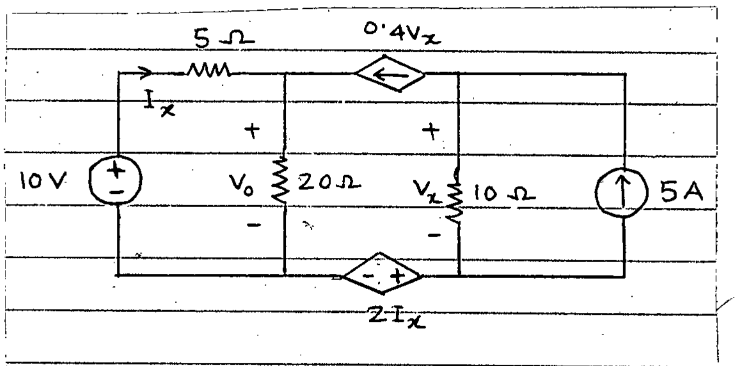

Fig. for Q. 6(b)

7. (a) Using Thevenin's theorem, find the value of v_0 in the circuit shown in Fig. for Q. 7(a). **(17)**

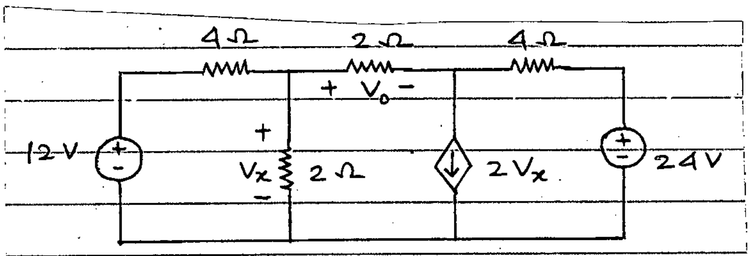

Fig. for Q. 7(a)

(b) Using Norton's theorem, find the value of I in the circuit shown in Fig. For Q. 7(b). **(18)**

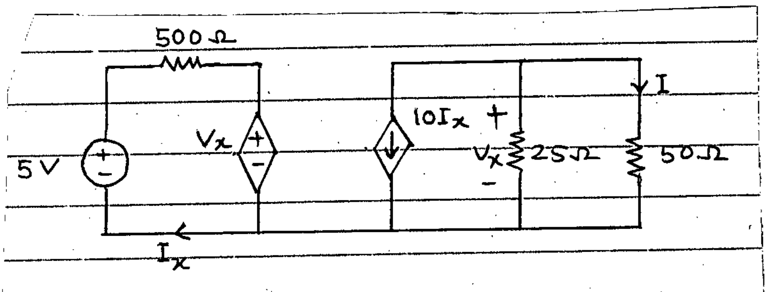

Fig. for Q. 7(b)

8. (a) Find the value of current I required to establish a magnetic flux of $\phi = 0.016$ wb in the magnetic circuit shown in Fig. for Q. 8(a). **(17)**

Each window: 8 inch × 8 inch

Thickness of the core: 4 inch

Cross-sectional area (throughout): 16 inch^2

Material: sheet-steel.

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Contd … Q. No. 8 (a)

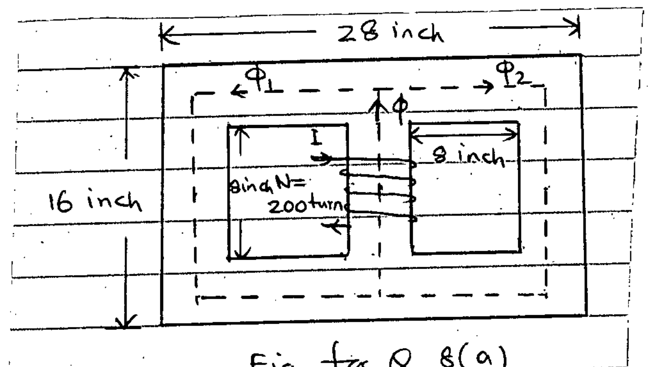

Fig for Q. 8(a)

(b) Using source transformations, find the value of v_1 in the circuit shown in Fig for Q. 8(b). **(18)**

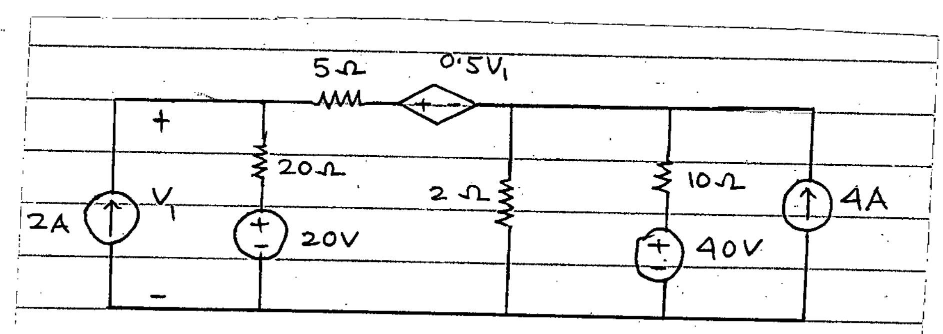

Fig. for Q. 8(b)

B-H Curve for Q.8(a)