

SECOND SEMESTER

B.E. (COE)

MID SEM EXAMINATION

March 2007

COE-114 INTRODUCTION TO PROGRAMMING

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer ALL questions.

Assume suitable missing data, if any.

- 1 Write a program which reads an array of 20 elements and then sends all negative elements of the array to the end without altering the original sequence. 2
- 2 Write a program to print the largest even and largest odd no from a list of nos entered through key board. 2
- 3 Write one word having the closest meaning of the following phrases.
 - v. Address of a variable.
 - vi. Homogeneous data structure
 - vii. Logical AND
 - viii. Variables retain its values in successive calls. 2
- 4[a] Is it legal for a function F_1 to call F_2 which then calls F_1 ? Justify yours answer.
- [b] What are the advantages and disadvantages of recursion? 3
- 5[a] Explain the following terms-
 - v. Break and continue.
 - vi. Data modifiers
 - vii. Storage devices.
 - viii. Scanf and printf 4

- 6 Differentiate the following –
- Call by value and call by reference.
 - Data and Information.
 - Local and global variable.
 - Hardware and software.
- 4

7[a] Explain with a help of example function definition, function prototype and function call for passing one integer, one character type variable and one two dimensional integer array to a function. 2

[b] What will be the output of the following program/ expression

(i) Main ()

```
{  
    int x = 0;  
    while ( x <= 10)  
        for ( ; ; )  
            if ( ++ x % 10 == 0)  
                break ;  
    print( " x = %d " , x );  
}
```

(ii) b = ++ c+++c; if c = 10

1

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SECOND SEMESTER

B.E. (COE)

MID SEM EXAMINATION

March-2007

COE-115 PHYSICS OF MATERIALS

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer ALL questions.

Assume suitable missing data, if any.

- 1[a] State and explain Heisenberg uncertainty principle. The average lifetime of an excited atomic state is 10^{-8} sec. If the wavelength of the spectral line associated with a transition from this state is 4000 Å. What is the width of this line? 1½
- [b] What are the essential properties of a wave function Ψ ? What do you mean by normalized wave function and expectation value?
A particle constrained to move along x-axis in the region $0 \leq x \leq a$ has a wave function $\psi = N \sin\left(\frac{n\pi x}{a}\right)$, where n is an integer. Normalize the wave function. 2
- [c] Write time dependent form of Schrodinger equation and obtain steady state form of Schrodinger equation from it. 1½
- 2[a] What is Meissner effect? Why flux exclusion and zero resistivity are considered to be independent and essential properties of superconductors? 1½
- [b] List three important applications of superconductors giving necessary background. What is SQUID? Why it is useful? 1½
- [c] Differentiate between AC and DC Josephson effect. Write the expression for the frequency of current produced, when a potential difference V is applied across a thin insulating layer sandwiched between two superconductors. What is the value of the frequency if $V = 1 \mu\text{V}$. 2

- 3[a] Define lattice, primitive cell and unit cell. Determine the size of the largest impurity that will fit into the voids of a face centered cubic structure. 2
- [b] What force is responsible for the formation of Argon crystal at low temperature? How this force arises? 1
- [c] Draw the plane (111) of silver (fcc) and show the projection of atoms on this plane. Given that the planer density of (111) plane in silver is 1.436×10^{24} atoms/sq.m, find the density of the material and the atomic diameter of silver atom. 2
- 4[a] Write down the relevant equation and from it define Fermi energy. Consider a semiconductor with Fermi energy in the middle of the forbidden energy gap. Find the percentage change in probability of occupation at the bottom of conduction band, when the temperature is increased from 300 K to 310 K. ($E_g = 0.20$ eV). 2½
- [b] A nickel in an excited state emits gamma ray photon with wavelength 9.31×10^{-4} nm. How many electrons can be excited from the top of the valance band to the bottom of the conduction band by absorption of this gamma ray? The band gap of the semiconductor is 1.12 eV. 1
- [c] Draw the energy level diagram of a p-n junction before equilibrium and after equilibrium. Explain physically why the donor and the acceptor energy levels are, just below the bottom of the conduction band and just above the top of the valence band respectively. 1½

Constants:-

Planck's constant $h = 4.14 \times 10^{-15}$ eV-s

Boltmann constant $k_B = 8.617 \times 10^{-5}$ eV K⁻¹

Avogadro's number $N_A = 6.02 \times 10^{23}$ mol⁻¹

Velocity of light $C = 3 \times 10^8$ m-s⁻¹

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SECOND SEMESTER

B.E. (COE/EC/EE)

MID SEM EXAMINATION

March 2007

COE/EC/EE-111 PRINCIPLES OF ELECTRICAL
ENGINEERING

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Question No. **ONE** is compulsory.
Answer any **THREE** questions from the rest.
Assume suitable missing data, if any.

1 Justify using proper reasons:

- [a] Voltage sources are short circuited and current sources open circuited for analysis of individual effect of each source. 1
- [b] Inductor behaves as short circuit and capacitor as open circuit when subjected to steady state dc sources 1
- [c] Instantaneous power and current cannot be expressed on a same phasor diagram. 1
- [d] Square and triangular alternating waveforms/ source are generally not suitable as compared to sinusoidal source for ac circuit. 1
- [e] Inductance and capacitance are called wattless element, even when they draw current from ac mains. 1

- 2[a] For the circuit in Fig.1 calculate the value of load resistor R_L for which maximum power is transferred to the load resistor. Also, calculate the maximum power transferred. 2

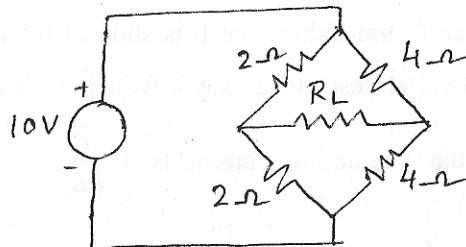


FIG 1 .

[b] Determine current drawn from V_s and voltage across I_s in Fig.2

3

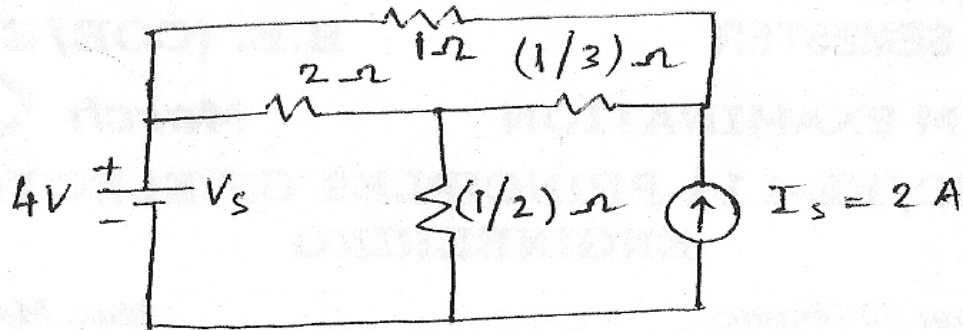


FIG. 2

3[a] Determine the current in the inductor of Fig.3.

3

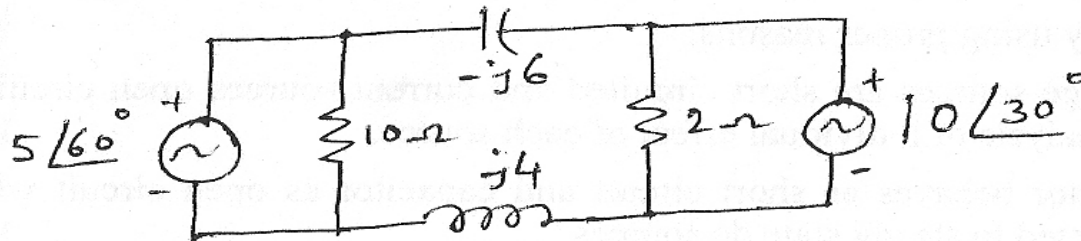


FIG. 3

[b] In the circuit of Fig.4 $v_s(t) = 100\sqrt{2}\cos(300t + 30^\circ)V$. Find $i_L(t)$, apparent, real, and reactive power consumed by the load.

2

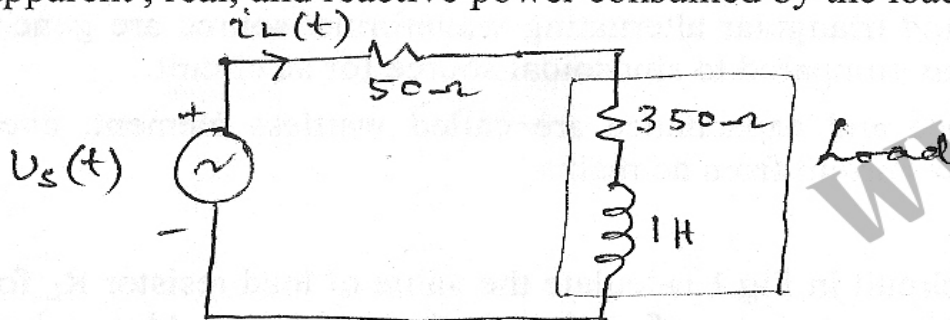


FIG. 4

4[a] A coil of resistance R and inductance L is shunted by a capacitor C . Show that, for parallel resonance, the effective resistance is $\frac{L}{CR}$.

Show also that the circulating current is $V\sqrt{\frac{C}{L}}$, so long as the resistance is small.

3

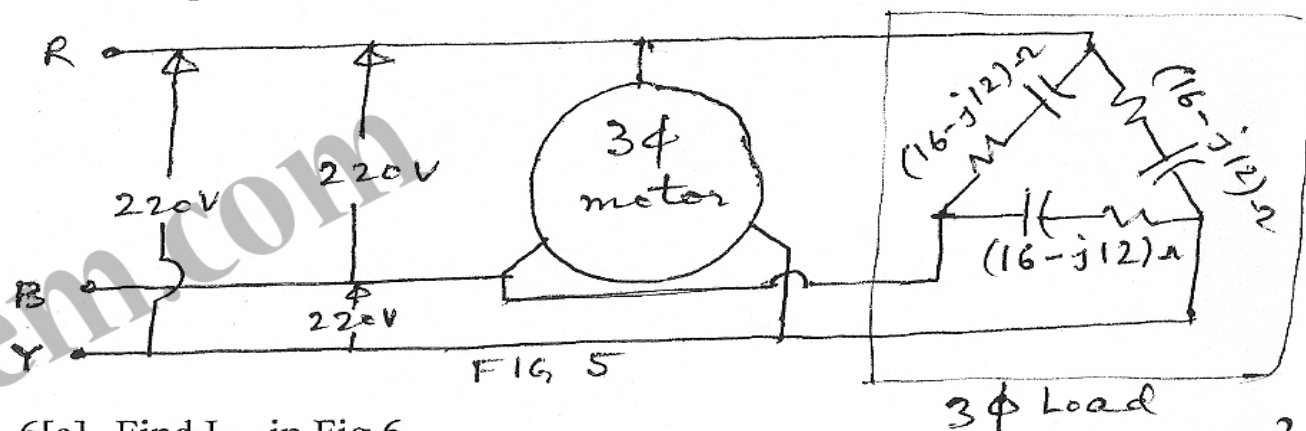
[b] A series circuit has a resistance of 2Ω and inductance of $0.25H$, a variable capacitance, and is connected across a 230 V , 50 Hz supply. Calculate

- The value of capacitance at resonance
- Q factor of the circuit and Bandwidth.

2

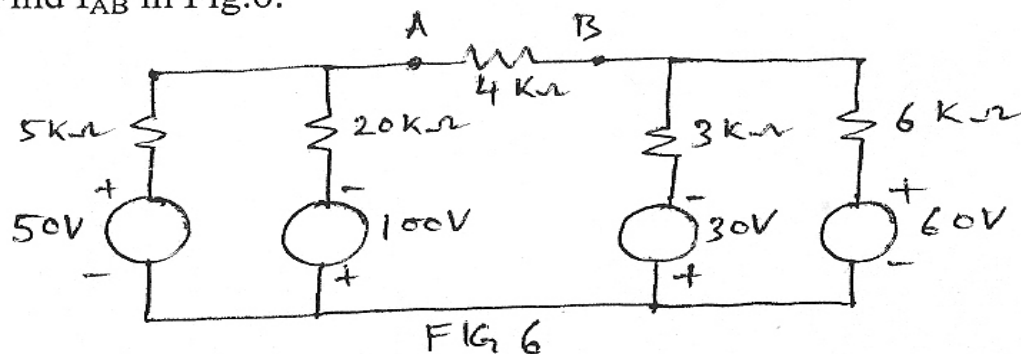
5 A 3 phase Y connected motor takes 10 KVA at 0.6 pf lag from a source of 220 V . It is in parallel with a balanced delta connected load as shown in Fig.5. Find the total volt amperes, active power, line current and p.f. of the combination.

5



6[a] Find I_{AB} in Fig.6.

2



[b] A circuit having VI characteristics as shown in Fig.7 has to be modelled as Thevenin's and Norton's form. Draw the equivalent circuits with computed values.

3

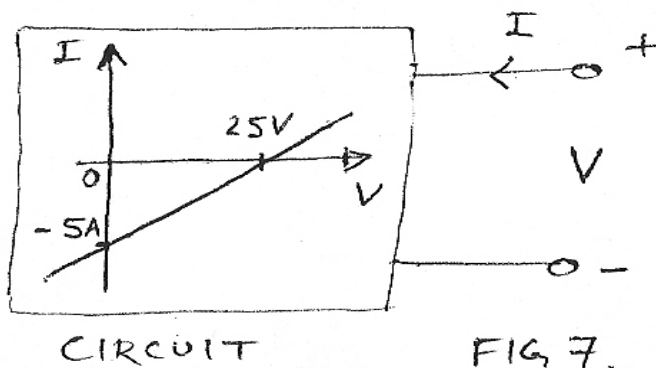


FIG 7.

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SECOND SEMESTER

B.E. (EC/EE/COE)

MID SEM EXAMINATION

March 2007

EC/EE/COE-112 APPLIED MECHANICS

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer ALL questions.

Local choices in questions 1 and 3 are to be made use of.

Assume suitable missing data, if any.

1[a] Explain Varignon's theorem.

1

[b] Determine the resultant of four forces, acting at A, B, C and D, tangential to the circle of radius 4 cm, as shown in Figure 1. Find the magnitude and location of the resultant w.r.t. the center of the circle, O.

5

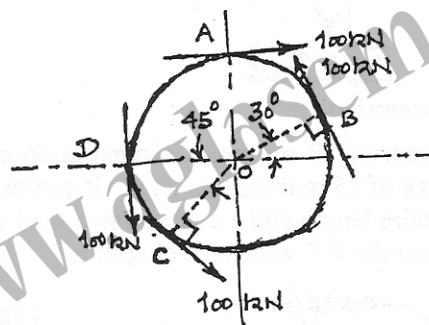


Figure 1.

[OR]

1[a] What is a 'just rigid truss'?

1

[b] Figure 2 shows a truss. Determine analytically forces in all its members. Also obtain reactions at both supports.

5

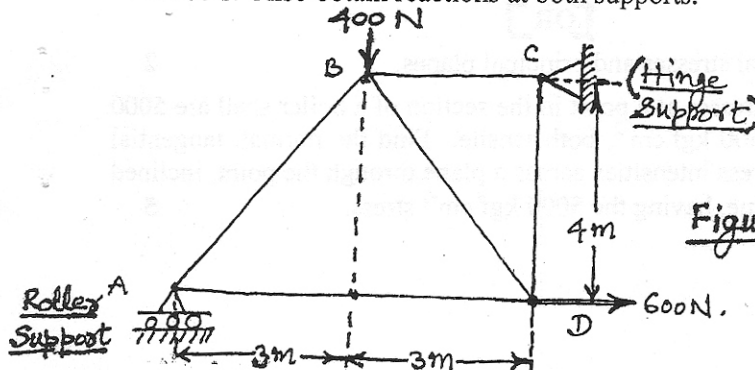


Figure 2.

- 2[a] What is understood by angle of repose and cone of friction? 2
- [b] Obtain the second moments of area and the section modulus of the section, shown in Figure 3 about the horizontal axis XX and vertical axis YY, passing through the centroid of the section. 5

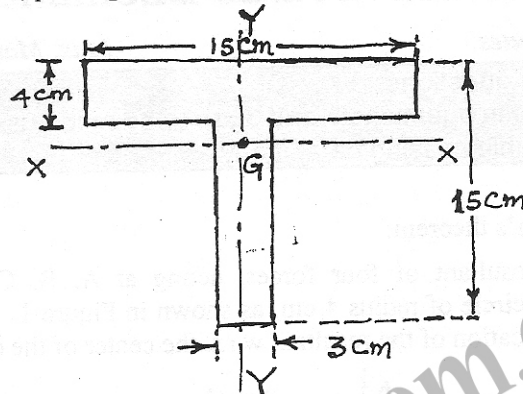


Figure 3.

- 3[a] Define the point of contraflexure. 1
- [b] Figure 4 shows a beam of 20 m length, hinged at an end and freely supported at a distance of 15 m from the hinge. It carries a u.d.l. of $0.5 \text{ tonnef.m}^{-1}$ over its entire length and a concentrated load of 16 tonnef at the free end. Construct the S.F. and B.M. diagrams. 6

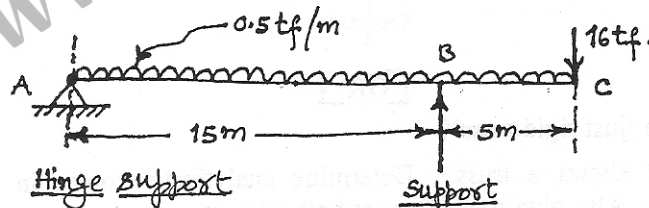


Figure 4.

[OR]

- 3[a] Explain principal stresses and principal planes. 2
- [b] The principal stresses at a point in the section of a boiler shell are 5000 kgf.cm^{-2} and 2500 kgf.cm^{-2} , both tensile. Find the normal, tangential and resultant stress intensities across a plane through the point, inclined at 50° to the plane, having the 5000 kgf.cm^{-2} stress. 5

SECOND SEMESTER

B.E. (COE/EC/EE)

MID SEM EXAMINATION

March

2007

COE/EC/EE-113 MATHEMATICS-II

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer ALL questions.

Assume suitable missing data, if any.

1[a] If $u = \tan^{-1}(y^2/x)$, Evaluate

$$x^2 u_{xx} + 2xy u_{xy} + y^2 u_{yy}$$

[b] Derive the formula for the second differential coefficient of an implicit function.

[c] Find the volume of the greatest rectangular parallelopiped that can be inscribed in the ellipsoid

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$$

7

2[a] Find the volume of the torus generated by revolving the circle $x^2 + y^2 = 4$ about the line $x = 3$.

[b] Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_{\sqrt{x^2+y^2}}^1 \frac{dz dy dx}{\sqrt{x^2+y^2+z^2}}$

[c] Find the area of the portion of the sphere $x^2 + y^2 + z^2 = 9$ lying inside the cylinder $x^2 + y^2 = 3y$

6