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## SECOND SEMESTER

B.E. (IT)

MID SEM EXAMINATION

March 2006

### IT-111 PRINCIPLES OF ELECTRICAL ENGINEERING

Time: 1 Hour 30 Minutes

Max. Marks : 20

**Note :** Answer **ALL** questions.  
Assume suitable missing data, if any.

- 1[a] Find the power delivered by the 5A current source in the circuit shown in Fig.1 by using the nodal method. 2 ½

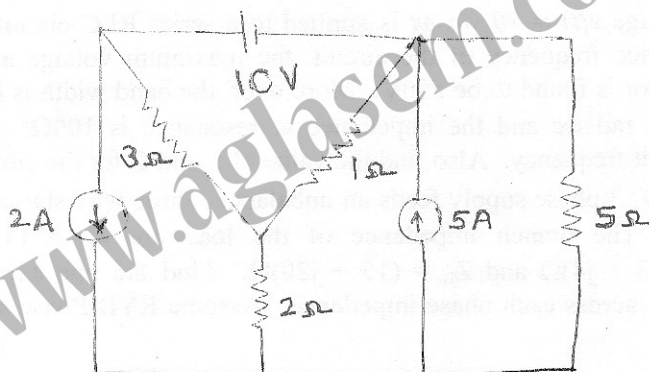


Fig. 1

- [b] Find the current in 80Ω resistor in the circuit shown in Fig.2 by Thevenin's theorem. 2 ½

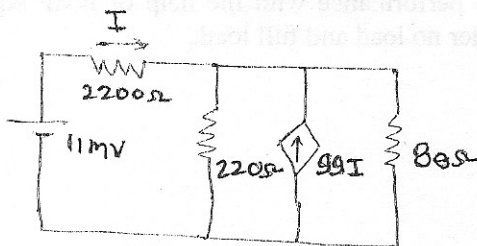


Fig. 2

- 2[a] State and explain the maximum power transfer theorem for AC circuit. 2½
- [b] For the circuit shown in Fig.3 find the value of Z that will receive the maximum power. Determine also this power. 2½

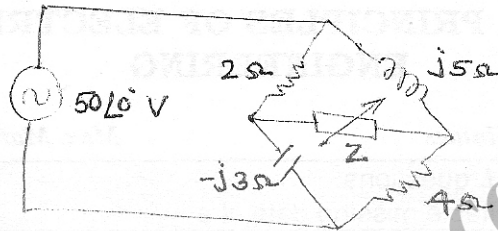


Fig. 3

- 3[a] A voltage  $v(t) = 10 \sin \omega t$  is applied to a series RLC circuit. At the resonance frequency of the circuit, the maximum voltage across the capacitor is found to be 500V. More over, the band width is known to be 400 rad/sec and the impedance at resonance is  $100\Omega$ . Find the resonant frequency. Also find the value of L and C for the circuit. 2½
- [b] A 400V, 3 phase supply feeds an unbalanced three wire star-connected load. The branch impedance of the load are  $Z_R = (4 + j8)\Omega$ ,  $Z_Y = (3 + j4)\Omega$  and  $Z_B = (15 + j20)\Omega$ . Find the line currents and voltage across each phase impedance. Assume RYB-Phase sequence. 2½
- 4[a] Describe the similarities and dissimilarities between electric and magnetic circuit. 2½
- [b] Explain the principle of operation of single phase transformer. Describe its performance with the help of EMF equations, its phasor diagram under no load and full load. 2½

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## SECOND SEMESTER

B.E. (IT)

MID SEM EXAMINATION

March 2006

### IT-112 MECHANICAL SCIENCES

Time: 1 Hour 30 Minutes

Max. Marks : 20

**Note :** Answer **ALL** questions.  
Assume suitable missing data, if any.

- 1 Velocity distribution over the plate is given by  $U = \frac{3}{4}y - y^2$   
where U is the velocity at a distance y meters above the plate.  
Determine the shear stress at a distance of 0.15m from the plate. Assume the dynamic viscosity of the fluid is 0.834  $\frac{N - \text{sec}}{m^2}$ . 3
- 2 An ideal Otto cycle (with air as the working fluid) has a compression ratio of 8. The minimum and maximum temperatures of the cycle are 310K and 1600 K respectively. Using constant specific heats at room temperature determine  
(i) The amount of heat transfer to air during heat addition process  
(ii) The thermal efficiency of the cycle  
(iii) Thermal efficiency of carnot cycle operating between same temperature limits. 6
- 3 A girder of 50m long carrying a uniformly distributed load of w kN/m is to be supported on two pier of 28m apart. So that the greatest bending moment shall be as small as possible. Find the distance of the piers from the ends of the girder and the bending moment. 6
- 4 A 400 kW power has to be transmitted at 100 rpm.  
(i) determined the dia of solid shaft of circular type.  
(ii) dia of hollow shaft if inside diameter is 0.82 times of outer diameter. Assume allowable shear stress is 76  $N/mm^2$   
(iii) also find the saving of material if hollow shaft is used. 5

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## SECOND SEMESTER

B.E.(IT)

MID SEM EXAMINATION

March

2006

### IT-113 ENGINEERING MATHEMATICS-I

Time: 1 Hour 30 Minutes

Max. Marks : 20

**Note :** Question No. 1 is compulsory.  
Answer any **TWO** questions from remaining.  
Assume suitable missing data, if any.

1[a] If  $u = f(r)$  where  $r^2 = x^2 + y^2 + z^2$ , show that

$$u_{xx} + u_{yy} + u_{zz} = f''(r) + \frac{2}{r} f'(r) \quad 3$$

[b] Find the approximate value of

$$\left[ (0.98)^2 + (2.01)^2 + (1.94)^2 \right]^{1/2} \quad 3$$

2[a] Let  $z = f(x, y)$ , where  $x = e^u \cos v$ ,  $y = e^u \sin v$  show that

$$\left( \frac{\partial z}{\partial x} \right)^2 + \left( \frac{\partial z}{\partial y} \right)^2 = e^{-2u} \left[ \left( \frac{\partial z}{\partial u} \right)^2 + \left( \frac{\partial z}{\partial v} \right)^2 \right] \quad 3\frac{1}{2}$$

[b] Locate the stationary points of  $x^4 + y^4 - 2x^2 + 4xy - 2y^2$  and determine their nature.  $3\frac{1}{2}$

3[a] Change the order of integration in

$$\int_0^a \int_0^x \frac{f'(y) dx dy}{\sqrt{(a-x)(x-y)}} \quad 3\frac{1}{2}$$

[b] Find the volume common to the sphere  $x^2 + y^2 + z^2 = a^2$  and the cylinder  $x^2 + y^2 = ax$   $3\frac{1}{2}$

4[a] Prove that

$$\text{curl}(\bar{A} \times \bar{B}) = (\text{div} \bar{B}) \bar{A} - (\text{div} \bar{A}) \bar{B} + (\bar{B} \cdot \nabla) \bar{A} - (\bar{A} \cdot \nabla) \bar{B}$$

where the symbols have their usual meaning.  $3\frac{1}{2}$

[b] Show that the vector field defined by

$$\bar{F} = 2xyz^3 \hat{i} + x^2 z^3 \hat{j} + 3x^2 yz^2 \hat{k}$$

is irrotational. Find the scalar potential  $\phi$   $3\frac{1}{2}$

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**SECOND SEMESTER**

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**B.E. (IT)**

**MID SEM EXAMINATION**

**March**

**2006**

**IT-114 INTRODUCTION TO PROGRAMMING**

**Time: 1 Hour 30 Minutes**

**Max. Marks : 20**

**Note : Answer ALL questions.**

**Assume suitable missing data, if any.**

- 1[a] Write a program in 'C' to find the factorial of a positive integer. 3
- [b] Draw flowchart to print the largest even and largest odd numbers from a list of numbers entered through keyboard. 2
- 2 Write short notes :
- [a] Data types & qualifiers
  - [b] Logical operators
  - [c] Storage devices
  - [d] Decision making control statements
  - [e] Library functions 5
- 3[a] Find the values of the following expressions based on the declarations & initial assignments below
- int i = 8, j = 6, k;
- float a = 2.6, b = 0.009, c = 4000;
- (i)  $k = (j == 5) ? i : j$
  - (ii)  $2 * ((i/5) + (4 * (j - 3)) \% (i + j - 2))$
  - (iii)  $!(i < j)$
  - (iv) `printf ("%8.4f %8.4f %8f", a, b, c)` 2
- [b] A program contains `char test[80];`
- write printf function to display first eight characters, followed by five blanks. 1
- [c] Write a loop to find the sum of every third integer beginning with i = 2 for i < 100 (i.e. 2 + 5 + .....). 2
- 4[a]  $(110101110)_2 + (321)_{10} = (321)_8 + ( )_{16}$  1

[b] Explain the meaning

- (i) void func(long a, short b);
- (ii) unsigned f2 (unsigned a, int b);
- (iii) void f3 (void);
- (iv) function prototype

2

[c] Explain the difference between character constant & string constant.

1

[d] Describe the output

```
#include <stdio.h>
```

```
main ( )
```

```
{
```

```
    int i, p, a = 0;
```

```
    for (i = 0 ; i < 6; ++i)
```

```
        for (p = 0; p < i; p++)
```

```
        {
```

```
            a += ( i + p - 1);
```

```
            printf ("%d", a);
```

```
            break;
```

```
        }
```

```
    printf ("\na = %d", a);
```

```
}
```

1

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**B.E. (IT)**

**MID SEM EXAMINATION**

**March**

**2006**

**IT-115 DISCRETE STRUCTURES**

**Time: 1 Hour 30 Minutes**

**Max. Marks : 20**

**Note :** Answer **ALL**, by selecting **TWO** parts from each question.  
Assume suitable missing data, if any.

- 1[a] Let  $R$  be an equivalence relation on  $A$  and  $[a]$  be an equivalence class of  $a \in A$ , then prove that  
(i)  $a \in [a] \forall a \in A$   
(ii)  $[a] = [b]$  iff  $(a, b) \in R$   
(iii) If  $[a] \neq [b]$  then  $[a] \cap [b] = \emptyset$
- [b] Let  $H$  be a subgroup of a group  $G$ . Then prove that the relation  $R = \{(x, y) : x, y \in G, x^{-1}y \in H\}$  is an equivalence relation.
- [c] Show that  $f : \mathbb{R} \rightarrow \mathbb{R}$  defined by  $f(x) = 2x-3$  is a bijection and find its inverse, compute  $f^{-1}$  of and  $f \circ f^{-1}$ . **7**
- 2[a] Is an injective map from a set to itself a surjective map? Give reasons.
- [b] In how many ways can 5 physics books, 4 mathematics books, 3 history books and 2 computer books be arranged on a shelf so that all books of the same subject are together.
- [c] Show by induction  $2n < 3^n$  for All  $n \in \mathbb{N}$ . **6**
- 3[a] Let  $G$  be a group. Let  $f : G \rightarrow G$  be a function such that  $f(a) = a^2$ . Then prove that  $f$  is a homomorphism iff  $G$  is abelian.
- [b] Let  $f : G \rightarrow G'$  be a homomorphism. Then show that kernel of  $f$  is a normal sub group of  $G$ .
- [c] Prove that the homomorphic image of a group is a group. **7**