Department of Electronics and Communication Engineering, NIT Patna
End-Term Semester Examination
Electronics Workshop (EC15103/ EC111103)
B.Tech. Semester –I

Max Marks: 60 **Time: 3:00 Hrs.**

Note: All questions carry equal marks. Any missing data may be assumed suitably.

1 (a) What are the various electronic workshop tools? List out it. Briefly describe any five of them.
(b) Draw the symbolic representation of the photodiode, varactor diode, CRO and NPN transistors.

2 (a) In the following circuit Fig. 1, an input voltage Vi = 10sin100πt is applied. Assume that the diode drop is 0.7 V when it is forward biased. The Zener breakdown voltage is 6.8V. Calculate the maximum and minimum values of the output voltage respectively.
(b) Calculate the current passing through idea diode (*i*) in Fig. 2.

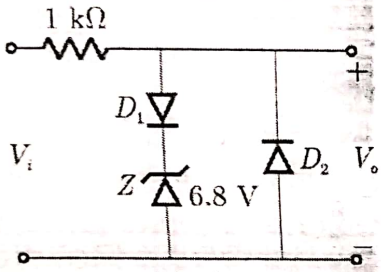


Fig. 1.

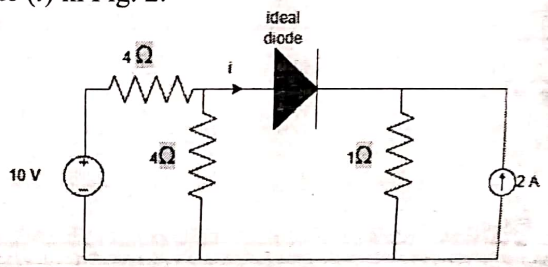


Fig. 2.

3 (a) Explain the working principle of soldering and desoldering with different components in details.
(b) Determine current flowing through diode D_2 in the below Fig. 3. Assume the D_1 is silicon diode and D_2 is germanium diodes.

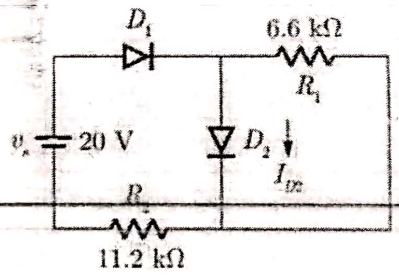


Fig. 3

4 What is an attenuator? Explain the T-type attenuator and derive each parameter of the attenuator. If the attenuation (A_{dB}) of the attenuator and Ro (impedance) are 18 dB and 600 Ω, respectively, analyze the circuit. Based on this analysis, draw the T-type attenuator.

5 (a) If the current gain coefficient of common collector is 59, find out the value of the remaining two current gain.
(b) What is electromagnetic interference (EMI) in electronic systems, and also discuss types of Electromagnetic Interferences?

6 (a) Discuss the fixed voltage IC regulators with proper diagram.
(b) Explain in details of (i) constant current source IC regulators circuit (ii) variable output voltage IC regulator circuit.

NATIONAL INSTITUTE OF TECHNOLOGY PATNA

(An Institute under Ministry of HRD, Govt. of India)

End Semester Examination- 12th December 2024

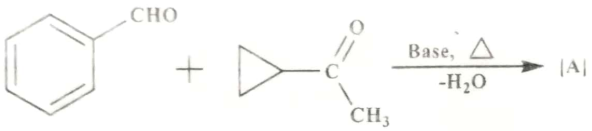
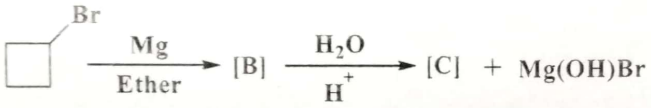
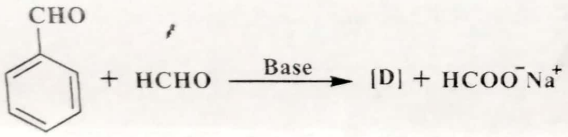
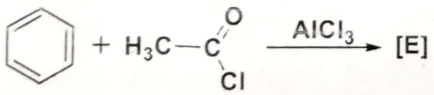
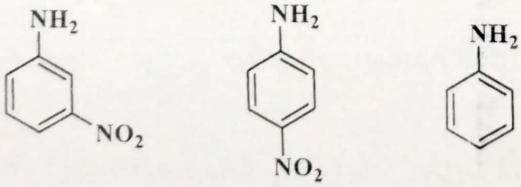
Program: B.Tech 1st Year, ECE

Course Code : CH15101 | **Course name: Engineering Chemistry**

Time:3.00 Hours | **Full Marks: 60**

Attempt all Questions and read the question carefully.

Sl. N.	Questions	Marks	CO
1.	i) In an experiment 0.680 g of a fuel was burnt in bomb calorimeter in presence of excess of oxygen. The rise in temperature due to heat generated was 3.61^{0}C for 1080g of water in the calorimeter. If water equivalent of calorimeter is 150 g. Calculate the net calorific value of the fuel.	[5]	CO1
	(ii) Define the following terms: a.Cetane number; b. Octane Number	[5]	CO1
	(iii) What is the Kjeldahl method for estimation of nitrogen in Coal? Draw the complete diagram of Kjeldahl distillation Unit?	[5]	CO1
2.	The equivalent conductivity at infinite dilution of KCl, HCl and CH_3COOK are 130.1, 379.4 and 95.6 ohm^{-1} cm^2 eq^{-1} respectively. Calculate the equivalent conductivity at infinite dilution for CH_3COOH. If equivalent conductivity of a given acetic acid solution is 48.5 ohm^{-1} cm^2 eq^{-1} at 25^{0}C. Calculate the degree of dissociation of CH_3COOH at this temperature.	[3+3]	CO2
3.	Determine the standard equilibrium constant of the following reaction at 298 K. $2\,MnO_4^- + 6H^+ + 5H_2C_2O_4 \rightarrow 2Mn^{2+} + 8H_2O + 10\,CO_2$ Given that: $E^0_{MnO_4^-,Mn^{2+}H^+/Pt} = 1.51\,V$; $E^0_{H_2C_2O_4/CO_2/Pt} = -0.49\,V$	[5]	CO2
4.	Define the following terms (i) Transport Number ; (ii) Liquid Junction Potential; (iii) Kohlrauch's law of independent migration of ions; (iv) Ionic mobility	[4]	CO2

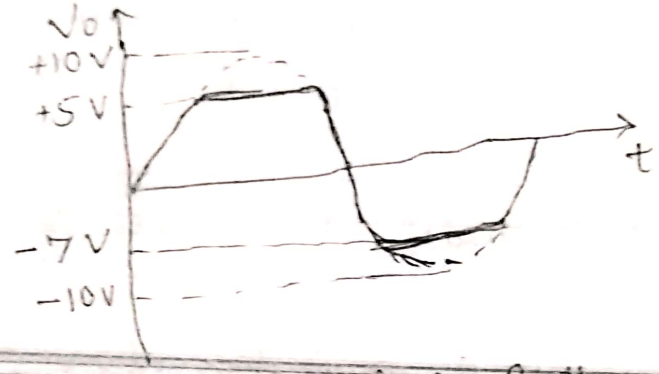
5	What are Werner postulates? State its limitation	[5]	CO3
6	Arrange the following octahedral complexes in decreasing order of their crystal field splitting. Give reasons also. $[CrF_6]^{3-}$, $[Cr(H_2O)_6]^{3+}$, $[Cr(NH_3)_6]^{3+}$, $[Cr(CN)_6]^{3-}$	[4]	CO3
7	(i) What is the oxidation state of the central metal ion and the magnetic behaviour of $[Cu(CN)_4]^{2-}$ (ii) Why is $[Co(NH_3)_6]^{3+}$ more stable than $[Co(NH_3)_6]^{2+}$?	[3+3]	CO3
8	Write the missing structure for the letters A to E i.  ii.  iii.  iv.  	[5]	CO4
9	Arrange the following amines in their decreasing basicity order. Explain the reason behind it.  	[5]	CO4
10	Write the summary of S_N1 and S_N2 substitution reactions, listing their similarities and differences in table form.	[5]	CO4

B. Tech 1st Sem ECE End Sem Exam Dec'2024

Elements of Electronics Engg. (EC-15102)

Time-3 hrs Answer any five question F.M-60

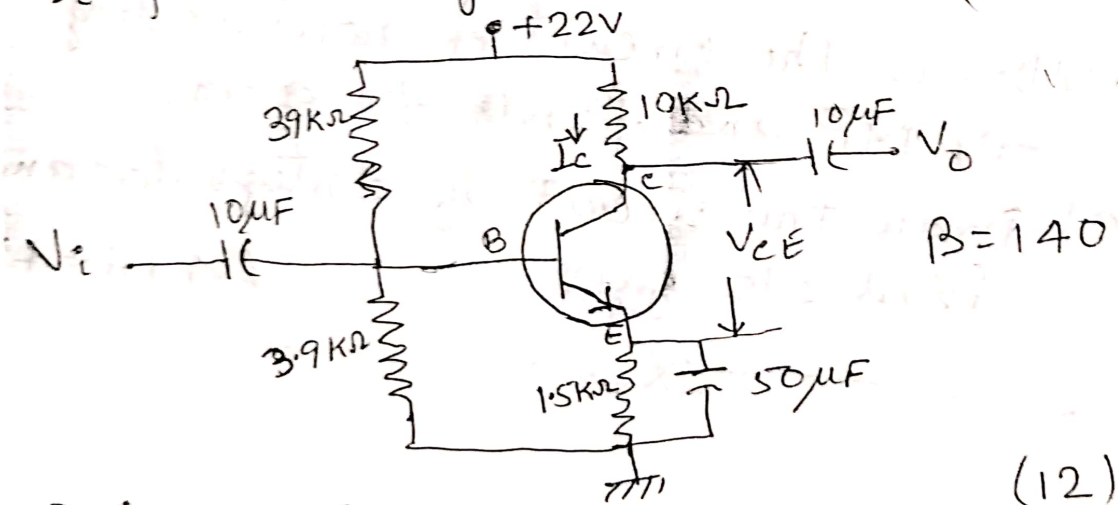
Q1 (a) Draw a clipper circuit for given output



(b) Draw a circuit of full wave voltage doubler and justify it.

(c) Discuss about Photo diode (4+4+4)

Q2. Determine the d.c. bias voltage V_{CE} and current I_C for circuit given below.



(12)

Q3. Define different Stability factor and find $S(I_{CO})$ for voltage devider bias (12)

PTO

Q4 (a) Draw schematic diagram of JFET

(b) Draw output and transfer characteristic of JFET mentioning all the parameters.

(c) Find the mathematical expression for transconductance of JFET (4+4+4)

Q5 (a) Draw the schematic diagram of Enhancement MOSFET

(b) Draw the output and transfer characteristics of E-MOSFET.

(c) Write the equation for drain current and draw symbol for E-MOSFET (4+5+3)

Q6. (a) write characteristic of Ideal OPAMP

(b) Draw the circuit of noninverting OPAMP and finds its gain.

(c) Draw the circuit of integrator and find its gain (4+4+4)

X

NATIONAL INSTITUTE OF TECHNOLOGY PATNA
END-SEMESTER EXAMINATION, JULY-DEC 2024

Program: B.Tech. (ECE) | **Semester: 1st**
Department: CSE | **Course Code: CS15101**
Full Marks:60 | **Course Name:** Introduction to Computing

Duration of Examination: 3 hours

INSTRUCTIONS

- Answer all the questions. Assume Missing data, if any

Predict the output of the following. Give necessary reasons and workout to support the response. Mere writing output won't result in full marks. (30*2=60M)

1.
```
#include <stdio.h>
void main() [CO7][L3,L4]
{
   register int i = 10;
   int *p = &i;
   *p = 11;
   printf("%d %d\n", i, *p);
}
```

2.
```
#include <stdio.h>
void main()  [CO2][L2]
{
   register static int i = 10;
   i = 11;
   printf("%d\n", i);
}
```

3.
```
#include <stdio.h>
void main() [CO6][L4]
{
   register int x = 5;
   m();
   printf("x is %d", x);
}
void m()
{
   x++;
}
```

4.
```
#include <stdio.h> [C06][L3,L4]
void foo(auto int i);
void main()
{
   foo(10);
}
void foo(auto int i)
{
   printf("%d\n", i );
}
```

5.
```
#include <stdio.h>
void main()[CO7][L2,L3]
{
   double *ptr = (double *)100;
   ptr = ptr + 2;
   printf("%u", ptr);
}
```

6.
```
#include <stdio.h>
void main()[C02][C07][L3]
{
   char *s = "hello";
   char *n = "cjn";
   char *p = s + n;
   printf("%c\t%c", *p, s[1]);
}
```

7.
```
#include <stdio.h> [CO5][L3]
#include <string.h>
void main()
{
   char *str = "hello, world\n";
   char *strc = "good
morning\n";
   strcpy(strc, str);
   printf("%s\n", strc);
}
```

8. #include <stdio.h>[CO4][L2]
```
void main()
{
  int a[2][3] = {1, 2, 3, , 4, 5};
  int i = 0, j = 0;
  for (i = 0; i < 2; i++)
  for (j = 0; j < 3; j++)
  printf("%d", a[i][j]);
}
```

9. #include <stdio.h>[C04][L3]
```
void main()
{
  char a[10][5] = {"hi", "hello",
"fellows"};
  printf("%s", a[2]);
}
```
hello

10. #include <stdio.h>[CO7][L2]
```
void main()
{
  int k = 5;
  int *p = &k;
  int **m  = &p;
  printf("%d%d%d\n", k, *p, **p);
}
```

11. #include<stdio.h>[CO2][L3]
```
void main()
{
  int a = 1, b = 2, c = 3, d = 4, e;
  e = c + d = b * a;
  printf("%d, %d\n", e, d);
}
```
0 1

12. #include <stdio.h>[C02][L2]
```
void main()
{
  int x = 3, y = 2;
  int z = x /= y %= 2;
  printf("%d\n", z);
}
```
0

13. #include <stdio.h>[C02][L2]
```
void main()
{
  int k = 8;
  int m = 7;
  k < m ? k = k + 1 : m = m + 1;
  printf("%d", k);
}
```

14. #include <stdio.h>
```
void main() [C02][L3]
{
  int var = 010;
  printf("%d", var);
}
```
8

15. #include <stdio.h>
```
void first()[C06][C07][L3,L4]
{
  printf("Hello World");
}
void main()
{
  void *ptr() = first;
  ptr++
  ptr();
}
```

16. #include <stdio.h>
```
void main()[CO7][C04][L4]
{
  const int ary[4] = {1, 2, 3, 4};
  int *p;
  p = ary + 3;
  *p = 5;
  printf("%d\n", ary[3]);
}
```
5

17. #include <stdio.h>
```
void main() [CO2][L3]
{
  int a = -1, b = 4, c = 1, d;
  d = ++a && ++b || ++c;
  printf("%d, %d, %d, %d\n", a,
b, c, d);
}
```
0, 4, 2, 1

18. #include <stdio.h> [C02][L2]
```
void main()
{
  {
    int x = 8;
  }
  printf("%d", x);
}
```

19. #include <stdio.h> [C07][L4]
```
void main()
{
  int k = 4;
  int *const p = &k;
  int r = 3;
  p = &r;
  printf("%d", p);
}
```

20. #include <stdio.h> [CO2][L2]
```
void main()
{
  int x = 2, y = 2;
  float f = y + x /= x / y;
```
4 1

```
        printf("%d %f\n", x, f);
        return 0;
    }
21. #include <stdio.h>
    void main()  [CO2][L3]
    {
        int x = 2, y = 2;
        int z = x ^ y & 1;
        printf("%d\n", z);
    }
22. #include <stdio.h>
    void main()[CO2][L3]
    {
        int x = 2, y = 0;
        int z = x && y = 1;
        printf("%d\n", z);
    }
23. #include <stdio.h>
    void main() [CO2][CO7][L4]
    {
        int n=5, *ptr=&n, x=*ptr;
        printf("%d%d", n,
    x+2,(*ptr)++);
    }
24. #include <stdio.h>
    void main() [C02][CO4][L3]
    {
        printf("hello world"+3);
    }
25. #include <stdio.h>
    struct student[CO5][CO7][L3]
    {
        char *c;
    };
    void main()
    {
        struct student *s;
        s->c = "hello";
        printf("%s", s->c);
    }
26. #include <stdio.h>
    void main()[C04][C07][L4]
    {
        char *a[10] = {"hi", "hello",
"how"};
        printf("%d\n", sizeof(a[1]));
    }
27. #include <stdio.h>
    void main() [CO2][L2]
    {
        int a = 10;
        if (a == a--)
            printf("TRUE 1\t");
        a = 10;
        if (a == --a)
            printf("TRUE 2\t");
    }
28. #include <stdio.h>
    int main() [CO4][L3]
    {
        int arr[]={1,2,3,4,5};
        printf("%d",++(*arr));
        return 0;
    }
29. #include <stdio.h>[CO4][C07][L4]
    int main() {
        char
    arr[]="KUMARABHISHEK";
    char *ps=arr;
        ps++;
        while(*ps!='H')
            printf("%c",*ps++);
    return 0;
    }
30. #include <stdio.h>
    void  main()[CO4][C07][L4]
    {
        void *p;
        int a[4] = {1, 2, 3, 8};
        p = &a[3];
        int *ptr = &a[2];
        int n =(int *) p - ptr;
        printf("%d\n", n);
    }
```

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NATIONAL INSTITUTE OF TECHNOLOGY PATNA

DEPARTMENT OF MATHEMATICS

END-SEMESTER EXAMINATION : DECEMBER 2024

ENGINEERING MATHEMATICS — COURSE CODE: MA15102

TIME: 3 HOURS — MAXIMUM MARKS: $6 \times 10 = 60$

Answer **all** questions

1. (a) Reduce the following matrix into normal form

$$A = \begin{pmatrix} 1 & 0 & 1 & 1 \\ 1 & 1 & -1 & 2 \\ 2 & 0 & 1 & 0 \\ 0 & -1 & 1 & 3 \end{pmatrix}.$$

Hence find its rank.

(b) Determine whether the set

$$S = \{-1 - x + 2x^2, 2 + x - 2x^2, 1 - 2x + 4x^2\}$$

is a basis for $P_2(R)$.

[3+3=6 marks] [CO.1]

2. Determine the eigenvalues and eigenvectors of the matrix

$$A = \begin{pmatrix} 2 & 0 & 1 \\ 1 & 0 & 1 \\ 1 & -2 & 0 \end{pmatrix}$$

State Cayley-Hamilton's theorem. Verify Cayley-Hamilton theorem for the given matrix A. Hence deduce A^{-1}. [3+3=6 marks] [CO.1]

3. Check the convergence of the series

$$1 + \frac{2.x}{2!} + \frac{3^2.x^2}{3!} + \frac{4^3.x^3}{4!} + \ldots\ldots\ldots\ldots \quad \text{for } x > 0.$$

[6 marks] [CO.2]

4. Show that the function

$$f(x,y) = \begin{cases} xy\dfrac{x^2 - y^2}{x^2 + y^2}, & \text{when } x^2 + y^2 \neq 0; \\ 0, & \text{when } x = 0,\ y = 0 \end{cases}$$

is continuous and possesses first partial derivatives at (0,0). Test the differentiability of the function at (0,0). [6 marks] [CO.2]

5. Let V is a function of x and y, and if, $x = u\cos\alpha - v\sin\alpha$ and $y = u\sin\alpha + v\cos\alpha$, where α is a constant, show that

$$\left(\frac{\partial V}{\partial x}\right)^2 + \left(\frac{\partial V}{\partial y}\right)^2 = \left(\frac{\partial V}{\partial u}\right)^2 + \left(\frac{\partial V}{\partial v}\right)^2.$$

[6 marks] [CO.2]

6. If $V = \cos^{-1}\dfrac{x+y}{x^{1/2}+y^{1/2}}$, then show that

$$x\frac{\partial V}{\partial x} + y\frac{\partial V}{\partial y} + \frac{1}{2}\cot V = 0.$$

[6 marks] [CO.2]

7. Find the extremum value of the function

$$f(x, y, z) = (x + y + z)^3 - 3(x + y + z) - 24xyz + a^3.$$

[6 marks] [CO.2]

8. Solve the differential equation

   (a) $(y^4 + 2y)dx + (xy^3 + 2y^4 - 4x)dy = 0.$

   (b) $\dfrac{dy}{dx} + \dfrac{y}{x}\log y = \dfrac{y}{x^2}(\log y)^2.$

[3+3=6 marks] [CO.3]

9. (a) Use the method of variation of parameter to solve the differential equation $y'' + 4y = 4\tan 2x$.

   (b) Solve the differential equation $(D^2 - 2D + 3)y = \cos x + x^2$.

[3+3=6 marks] [CO.3]

10. Solve the simultaneous differential equations

$$\begin{aligned} \frac{dx}{dt} + x &= y + e^t \\ \frac{dy}{dt} + y &= x + e^t. \end{aligned}$$

[6 marks] [CO.3]

** * * * **