University of Rajshahi

Department of Computer Science and Engineering

B.Sc. Engineering Part-1 Odd Semester Examination 2018

Course Code: **CSE1111** Course Title: **Introduction to Computer Systems**

Marks: 52.50 Time: 3 Hours

(Answer Six (06) Questions taking any Three (03) Questions from each Section)

Section-A

1.(a)	What is Computer? Explain the characteristics of Computer.	3
(b)	What are the basic operations of Computer? Describe them.	3.75
(c)	Compare microcomputers, minicomputers and main frames in terms of size and cost.	2
2. (a)	What are the different forms to represent negative signed binary numbers? Explain them with example.	3
(b)	Evaluate the binary number 10001111 in base 10 under (i) Signed magnitude notation and (ii) Two's complement notation.	3
(c)	Convert the followings (i) $(510.125)_{10}=()_2$? (ii) $(AEF5)_{16}$ to binary and octal.	2
(d)	Perform the subtraction 11110111-10110111 using 2's complement method.	0.75
3. (a)	Briefly describe the PC's system booting-up sequence.	3
(b)	Describe the function of the CPU as fetching and executing instructions stored in memory.	3
(c)	Explain the different factors affecting the processing speed of CPU.	2.75
4. (a)	Differentiate between LCD and LED monitors.	2.75
(b)	Discuss the printing mechanism of a laser printer.	3
(c)	Define the following terms: (i) Optical Mouse, (ii) Bar-code reader, and (iii) Modem.	3

Section-B

5. (a)	What is Memory? Draw the memory hierarchy according to their access speed.	2
(b)	What are the features of storage devices? Describe them.	3
(c)	Explain how data is stored on the surface of magnetic disk.	2
(d)	A 6 platter hard disk has 600 tracks per surface. There are 10 sectors per track and 512 bytes per sector. What is the storage capacity of the disk? How many cylinders does the disk pack have?	1.75
6. (a)	Define Operating System (OS) and explain functions of OS.	2.5
(b)	Explain three categories of OS with examples.	3
(c)	Differentiate between DOS and Windows.	2
(d)	Why is virtual memory needed?	1.25
7. (a)	Define computer networks. Mention four benefits that computer networks provide to their users.	2.75
(b)	Explain network topology. Discuss the function of Star and Bus topology and differentiate between them.	4
(c)	Define the following terms (i) IP address (ii) TCP/IP, (iii) SMTP, (iv) http.	2
8. (a)	Mention three utility programs with its purposes.	3
(b)	Define computer virus. Explain the characteristics of it.	2.5
(c)	How do viruses infect and spread in a computer system?	2
(d)	Mention different types of viruses with examples.	1.25

```
int c = 0;
int d=0;

printf ("value of a in main() = % \n",  a);
 c = sum( a, b);
 d = sub( a, b);
printf ("value of c in main() = %d\n",  c);
printf ("value of d in main() = %d\n",  d);
printf ("value of e in main() = %d\n",  e);
 return 0;
}

int sum(int a, int b) {
printf ("value of a in sum() = %d\n",  a);
printf ("value of b in sum() = %d\n",  b);
  return a + b;
}

int sub(int a, int b) {
int c=40;
printf ("value of a in sub() = %d\n",  a);
printf ("value of b in sub() = %d\n",  b);
  return a-b + c;
}
```

(b) What will be the output of the following code? Is there any better or easier way to produce the same output? If any, write the program? **5**

```
int main()
   {
int v[4][4];
int n=3;
     for(int i = 1;i <=n;++i)
     for(int j = 1;j <=n;++j)
      v[i-1][j-1]=(i/j)*(j/i);

      for(int i = 1;i <=n;++i)
      {
         for(int j = 1;j <=n;++j)
     {
printf("%d",v[i-1][j-1]);
      }
printf("\n");
       }

return 0;
  }
```

3. (a) How do logical errors differ from syntactic and execution errors? **2.00**
   (b) What are the purposes of using continue and break statement? Give example **3.00**
   (c) What is the purpose of using do-while statement? How does it differ from the while statement? Explain with example. **3.75**

4. (a) What will be the output of the following code? **3.00**

```
void operation(int *num1, int *num2)
{
int tempnum;
```

```
tempnum = *num1;
  *num1 = *num2;
  *num2 = tempnum;
}
int main( )
{
int v1 = 11, v2 = 77 ;
printf("Before operation:");
printf("\nValue of v1 is: %d", v1);
printf("\nValue of v2 is: %d", v2);

  operation( &v1, &v2 );

printf("\nAfter operation:");
printf("\nValue of v1 is: %d", v1);
printf("\nValue of v2 is: %d", v2);
}
```


(b) A 4x4 matrix is given in a file named in.txt. **5.75**

in.txt:

10	15	20	25
5	10	20	15
15	25	10	5
20	5	15	10

Read the matrix from the in.txt file, transform all the decimal numbers to its equivalent binary numbers and write into out.txt file.

out.txt:

1010	1111	10100	11001
101	1010	10100	1111
1111	11001	1010	101
10100	101	1111	1010

Section **B**

Answer any **THREE** questions.

5. (a) Some numbers are given as input and their average 214.400000 is calculated using getAverage() function. However, getAverage() is not defined. Your task is to define getAverage() function. **3.00**

```
int main () {
int balance[5] = {1000, 2, 3, 17, 50};
  double avg;
 avg = getAverage( balance, 5 ) ;
printf( "Average value is: %f ", avg );
  return 0;
}
```

(b) A programmer developed the following program to have the expected output as given below. However, expected output is not found. **5.75**

(i) What is the current output?

(ii) What is the error?

(iii) Make necessary correction.

Expected Output:

c
b
cb
a
ca

```
ba
cba

void possibleSubsets(char A[], int N)
  {
    for(int i = 0;i < (1 << N); ++i)
    {
      for(int j = 0;j < N;++j)
        if(i & (1 <<j))
printf("%c",A[j]);
printf("\n");
  }
  }

int main()
  {
    char A[]={'a','b','c'};
possibleSubsets(A,3);
    return 0;
  }
```

6. (a) What is dynamic memory allocation? **3.00**
   (b) Allocate memory for 100 integer numbers using dynamic memory allocation function in C. Store the numbers into the allocated memory. Your task is to write a program to find the largest number. **5.75**

7. (a) What is the purpose of using a header file? **2.00**
   (b) What is a structure? How does a structure differ from an array? **3.00**
   (c) In the following fragment of code what is the final value of a, b, c. **3.75**
   x=10; b=++x; c=b--; a=--b+a++;

8. (a) What conditions must be satisfied by all the elements of any given array? **2.00**
   (b) A new sorting approach is given. In this approach only one operation (Flip) is available and that is you can exchange two adjacent numbers. If you think a while, you will see that it is always possible to sort a set of numbers in this way. **6.75**

   A set of integers will be given. Now using the above approach you want to sort the numbers in ascending order. You have to find out the minimum number of flips required. Such as to sort '1 2 3'you need no flip operation, however, to sort '2 3 1' you need at least 2 flip operations.

   Input

   The input will start with a positive integer N ($N \leq 1000$). In next few lines there will be N integers. Input will be terminated by 0.

   Output

   For each data set print 'Minimum exchange operations: M' where M is the minimum flip operations required to perform sorting. Use a separate line for each case.

   Sample Input

   3
   1 2 3
   3
   2 3 1
   0

   Sample Output

   Minimum exchange operations : 0
   Minimum exchange operations : 2

University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engg. Part-1 Odd Semester, Examination-2018
Course: MATH-1111 (Algebra, Trigonometry and Vector)

Time: 3 Hours

Full Marks: 52.5

(Answer any **six** questions taking **three** from each Section)

Section: A

1 (a) Define complement of a set. State and prove De' Morgan's rules 3

(b) Evaluate $\begin{vmatrix} (b+c)^2 & c^2 & b^2 \\ c^2 & (c+a)^2 & a^2 \\ b^2 & a^2 & (a+b)^2 \end{vmatrix}$. 3

(c) Solve the following system of linear equation by Cramer's rule: 2.75
$x + y + z = 1;\ ax + by + cz = k;\ a^2x + b^2y + c^2z = k^2$

2 (a) State the fundamental theorem of algebra. Show that every equation of nth degree has exactly n roots. 3

(b) Find the condition that $x^3+px^2+qx+r=0$ may have the roots in Harmonical progression. 3

(c) If a, b, c are the roots of $x^3+qx+r=0$. Find the equation whose roots are $bc+\frac{1}{a}$, $ca+\frac{1}{b}$, $ab+\frac{1}{c}$. 2.75

3 (a) Solve the cubic following equation by cardon's method: $x^3-21x-344=0$. 3

(b) Show that the equation $\frac{A^2}{x-a}+\frac{B^2}{x-b}+\frac{C^2}{x-c}+\cdots+\frac{H^2}{x-h}=K$ has no imaginary roots. 3

(c) If the roots of $x^n-1=0$ are $1, \alpha, \beta, \gamma \ldots$ Show that $(1-\alpha)(1-\beta)(1-\gamma)\ldots = n$. 2.75

4 (a) State and prove De' Moivre's theorem. 3

(b) If $x=\cos\theta+i\sin\theta$ and $1+\sqrt{1-a^2}=na$, prove that $1+a\cos\theta=\frac{a}{2n}(1+nx)(1+\frac{n}{x})$. 3

(c) If $x_r=\cos\frac{\pi}{2^r}+i\sin\frac{\pi}{2^r}$, $r=1,2,3,4,\ldots$ *Find the value of* $\prod_1^\infty x^r$. 2.75

Section: B

5 (a) If $x=\frac{2}{1!}-\frac{4}{3!}+\frac{6}{5!}-\frac{8}{7!}+\cdots$ *to* ∞ *and* $y=1+\frac{2}{1!}-\frac{2^3}{3!}+\frac{2^5}{5!}-\cdots$ *to* ∞, *show that* $x^2=y$. 3

(b) If $\tan\log(x+iy)=a+ib$ *where* $a^2+b^2\neq 1$, *prove that* $\tan\log(x^2+y^2)=\frac{2a}{1-a^2-b^2}$. 3

(c) Separate $\log(a+ib)$ into real and imaginary part. 2.75

6 (a) If $\sin x=n\sin(a+x), -1<n<1$, *expand* x *in a series of ascending power of* n. 3

(b) Given that $y=\log\tan\left(\frac{\pi}{4}+\frac{x}{2}\right)=x+c_3x^3+c_5x^5+\cdots$, *show that* $x=y-c_3y^3+c_5y^5-\cdots$ 3

(c) Prove that $\frac{\tan^{-1}x}{x}+\frac{\tan^{-1}y}{y}+\frac{\tan^{-1}z}{z}=3[1-\frac{1}{7}+\frac{1}{13}-\frac{1}{19}+\frac{1}{25}-\cdots]$ where x, y, z are the three cube roots of unity. 2.75

7 (a) Find the sum of the series $\tan^{-1}\frac{1}{2.1^2}+\tan^{-1}\frac{1}{2.2^2}+\tan^{-1}\frac{1}{2.3^2}+\cdots$ *to n terms.* 3

(b) Sum to n terms the series $\tan\alpha+2\tan2\alpha+2^2\tan2^2\alpha+\cdots$ 3

(c) Sum the series to infinity: $\cos\theta-\frac{1}{2}\cos2\theta+\frac{1}{3}\cos3\theta-\cdots(-\pi<\theta<\pi)$. 2.75

8 (a) If $\underline{r_1}=2\underline{i}-\underline{j}+\underline{k}$, $\underline{r_2}=\underline{i}+3\underline{j}-2\underline{k}$, $\underline{r_3}=-2\underline{i}+\underline{j}-3\underline{k}$, *and* $\underline{r_4}=3\underline{i}+2\underline{j}+5\underline{k}$, find scalars a, b, c such that $\underline{r_4}=a\underline{r_1}+b\underline{r_2}+c\underline{r_3}$. 3

(b) Prove that $\overline{\nabla}\times(\overline{\nabla}\times\overline{A})=\overline{\nabla}(\overline{\nabla}.\overline{A})-\nabla^2\underline{A}$. 3

(c) A particle moves along the curve $x=2t^2$, $y=t^2-4t$, $z=3t-5$, where t is the time. Find the components of its velocity and acceleration at time t=1 in the direction $\underline{i}-3\underline{j}+2\underline{k}$ 2.75

University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engg. Part-1 Odd Semester, Examination-2018
Time: 3 Hours Course: CHEM-1111 (Physical and Inorganic Chemistry)

Full Marks: 52.5

[Answer **six** questions taking any **three** questions from each section]

SECTION: A

1 (a) Balance following equations by Ion-Electron method: 3

(i). $MnO_4^- + Fe^{2+} + \cdots \leftrightarrow Mn^{2+} + \cdots + H_2O$

(ii). $Cr_2O_7^{2-} + Fe^{2+} + \cdots \leftrightarrow Cr^{2+} + \cdots + H_2O$

(b) Differentiate 'Electrochemical' and 'Electrolyte' cell. 2

(c) What happens when a copper rod is dipped in a zinc sulfate solution? 1.75

(d) The galvanic cell represented as 2

$Mg(s) \mid Mg^{2+}\,(1\ mol.dm^{-3}) \mid\mid H^+\,(1\ mol.dm^{-3}) \mid H_2(g) \mid Pt(s)$

And the reading found on the voltmeter is 2.36 V.

Calculate the standard reduction potential of the magnesium half-cell. Show all of your working. And write down the balanced NET (overall) cell reaction that takes place in this cell. No spectator ions are required.

2 (a) Consider the following gaseous, reversible, exothermic reaction: A = B + C + D 1.25
What could be done to increase the equilibrium concentration of species D? Give your explanation in short.

(b) What is the correct equilibrium expression of the following chemical reaction? Give the explanation in favor of your answer. 3

$$NH_4NO_3(s) \leftrightarrow N_2O(g) + 2H_2O(g)$$

(c) A chemical reaction A + 3B = 2C + 2D is at equilibrium. You have measured the concentration of A and C to be [A] = 1.20M and [C] = 0.5M, respectively. What would be the equilibrium constant, K? Show your calculations. 1.5

(d) A chemical reaction at equilibrium releases 25 Kilo Joules of heat energy at 37°C. What is the entropy change for this same reaction? Hint: Consider $\Delta G = \Delta H - T\Delta S$. 3

3 (a) What do you mean by rate of chemical reaction? Give a chemical reaction to show the reaction of first order. 2

(b) Differentiate between molecularity and order of chemical reactions. 2

(c) Write the possible rate law equations of the following second order reactions: 1.75
$P + Q \rightarrow Product.$

(d) Calculate the order of a reaction, which has the rate expression is $rate = k[X]^{1/2}[Y]^{1/4}$. 1

(e) How does a catalyst increase the rate of chemical/ biochemical reactions? 2

4 (a) What do you understand by the term adsorption? Give four points of differences between physical adsorption and chemical adsorption. 3

(b) What is an adsorption isotherm? Deduce Langmuir's adsorption isotherm. 4

(c) Discuss the origin of charge on colloidal particles. 1.75

SECTION: B

5 (a) Draw the periodic table for first 36 elements with their correct symbols. You should also label the number of groups and periods of that segmented table. 5

(b) Give the electronic configuration of Chromium and Technetium. 2

(c) Discuss the basic properties of transition elements. 1.75

6 (a) Discuss the drawbacks of Rutherford's model for atomic structure. 1.5

(b) States the limitations of Bohr atomic model. 1.5

(c) The equation for the reaction is shown below: 1

$^{131}_{53}I \rightarrow {}^{Z}_{A}Xe + {}^{0}_{-1}\beta$

Write down the atomic number (A) and the mass number (Z) for the xenon.

(d) Describe what each of alpha, beta and gamma radiations is, and discuss what happens inside a nucleus when it produces each of three types of radiation. In your answer, you will need to state what happens to the atomic number and mass number. 3

(e) The half-life of 99m is 6.0 hours. 12 milligram of Technetium 99m is injected in a patient and starts to decay into Technetium 99. Calculate the amount of Technetium 99 present in the patient after 24 hours. [NB. Technetium 99m means meta-stable Technetium 99]. 1.75

7 (a) Explain with examples Hund's rule of maximum multiplicity. How does this rule help in determining the electronic configuration of elements? 2.75

(b) Explain the following giving appropriate reasons: 6

(i). Flourine is more electronegative than chlorine.

(ii). Na^+ is smaller than Na-atom but Cl^- is larger than Cl-atom.

(iii). The first ionization energy of N is more than that of O.

(iv). The electron affinity of noble gases is zero.

8 (a) Discuss sp^2 type of hybridization by giving one example. 2.75

(b) Draw the molecular orbital energy diagram for F_2 molecule. Label all of the orbitals specifically. Determine the bond order of molecule. Indicate whether the molecule is paramagnetic or diamagnetic. Compare the relative stabilities of molecular species F_2^- and F_2^+ based on their bond orders. 4

(c) According to the molecular orbital theory show (by ticking in the boxes), whether the following chemical species can be existed or not: 2

Species	Existed	Not	Species	Existed	Not	Species	Existed	Not
He_2			He_2^{2+}			H_2^-		
He_2^+			H_2^{2+}			H_2^{2-}		

University of Rajshahi

Department of Computer Science and Engineering

B.Sc. Eng. Part-1, Odd Semester Exam- 2018

ENG 1111 (Technical and Communicative English)

Time: 3 Hours. Full Marks: 35

[N.B. Answer any ~~three~~ two questions from each part.]

Section-A

1. a) Change the following sentences as directed (any four): 4

i) I had a supervisor who was very kind. (Make a simple sentence)
ii) He washed his car. It still looked dirty. (Make a compound sentence)
iii) Dean, being an honest officer, spoke the truth. (Make a compound sentence)
iv) It is obvious that he is going to be late. (Make two simple sentences)
v) Tell me your real name. (Make a complex sentence)

b) Use appropriate modals, according to the instructions in brackets. Use negatives where necessary (any four): 4

i) You ___ note down what I say. (Indicate no obligation)
ii) Johnson __ meet my father every afternoon. (Indicate a regular occurrence of past)
iii) The students ____ be waiting for results. (Indicate a guess about a present situation)
iv) Students who failed ___ retake the test. (Indicate permission)
v) The wrestler ____ beat his opponent. (Indicate a lack of ability)

c) Define independent clause with an example. 0.75

2. a) Complete the following conditional sentences (any three): 3

i) If my application is accepted, _____.
ii) _____, she would have been very happy.
iii) If Harold was so thirsty, _____.
iv) _____, the company will not survive.
v) If the earthquake had not occurred, _____.

b) Form wh-questions, for the following sentences, the answers of which should be the underlined words (any two): 2

i) Europeans are against this war. ii) Shane went to Africa for vacation.
iii) The new officer types very slowly. Iv) I may complete my degree in 2024.

c) Change the following words as directed (any three): 3

i) Compute (change into a noun) ii) Beauty (change into a verb)
iii) Friend (change into an adjective) iv) Broad (change into a verb)
v) Accurate (change into an adverb)

d) Define complete subject with an example. 0.75

3. a) Make meaningful sentences using the following idioms and phrases (any four): 4

i. Make out ii) Out of the question iii) All in all iv) Now and again v) Pross and cons.

b) Rewrite the following sentences with necessary corrections: 4

i. She looks forward to visit the book fair.
ii. Moni visited the campus with a view to enjoy the lush greenery of it.
iii. Henrik Ibsen is considered as one of the remarkable dramatist of twentieth century.
iv. Our teachers insisted we should visit the central library.

c) Define object complement with an example. 0.75

Section-B

4. Read the following passage and answer the questions below it:

The origin of the first computer virus is hotly debated. For some, the first instance of a computer virus --- software that moves from host to host without the input from an active user --- was Creeper, which first appeared in the early 1970s, 10 years before the actual term 'computer virus' was coined by American computer scientist Professor Leonard M. Adleman. Creeper ran on the Tenex operating system and jumped from one system to another, displaying a message of "I'M THE CREEPER : CATCH ME IF YOU CAN!" on infected machines, before transferring itself to another machine. For the most part, when it found a new machine, it removed itself from the previous computer. So it was not capable of spreading to multiple computers at once. While Creeper was not created for malicious purposes, beyond causing mild annoyance, it was arguably the first example ofa software operating in this way.

Alternatively, some believe the title of the first computer virus should go to one called Brain, because unlike Creeper, it could self-replicate itself without the need to remove itself from a previous system first, something many forms of malicious code now do.

The Morris Worm holds the notorious distinction of the first computer worm to gain mainstream media attention.Within hours of being connected to the early internet, it had infected thousands of computers. The damage of the lost productivity estimated to have cost between $100,000 and $10,000,000.Like Brain and Creeper before it, the Morris worm is not classed as malware, because it is another example of an experiment gone wrong. The software was designed to try to find out the size of the burgeoning internet with a series of scans in 1988, but mistakes in the code led to its running unintended denial of service operations, sometimes multiple times on the same machine, rendering some computers so slow that they became useless.

a) When did Creeper appear first? 1
b) What was the first computer worm to attract mainstream media attention? 1
c) In which decade was the term 'computer virus' coined? 2
d) According to the last paragraph, what is a common characteristic of Creeper, Brain and the Morris Worm? 2
e) Suggest a suitable title for the passage and justify it. 2.75

5. a) Write a paragraph on any one of the following: 5
   i. Your Favorite Book
   ii. University Education.

   b) Prepare a CV for the post of a lecturer. 3.75

6. a) Write a job application for the position of the Chief Technological Consultant of Longman Computers to its Managing Director. 4

   b) Suppose that you are a staff correspondent working for *The Daily Star*. You have recently visited a national programming contest in Dhaka where students from various universities participated. Now write a news report on it. 4.75

University of Rajshahi

Department of Computer Science of Engineering

B. Sc. (Engg.) Part-1,Odd Semester, Exam - 2018

Course Title: APEE1131 (Electrical Circuit and Electronics)

Total marks: 52.5 **Time: 3 Hours**

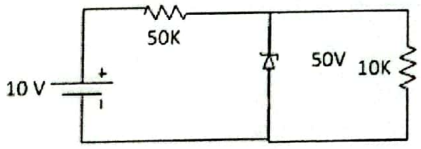
[Answer three questions from each section]

Section-A

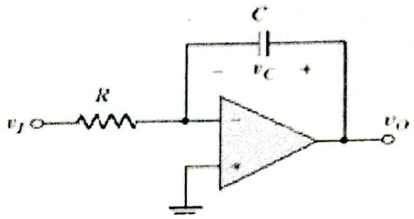
1. a) What is LCD? Describe the working principle of LCD. 3.75
   b) Compare between LED and LCD. 2
   c) What is P-N photodiode? Why it works in reverse biased condition? 3

2. a) Define conductor, semiconductor and insulator in terms of energy band diagram. 3
   b) Discuss the formation process of P-type and N-type extrinsic semiconductor with proper diagram. 3
   c) Consider a specimen of Silicon of length 1.5 cm and area 1 mm2. Calculate the i) conductivity ii) resistivity and iii) resistance of the specimen. (Assume $n_i = 1.5 \times 10^{16}, \mu_c = 0.13\ m^2/v-s$, $\mu_h = 0.05\ m^2/v-s$) 2.75

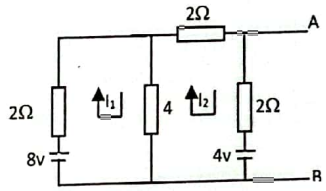
3. a) What is a PN junction diode? Show the V-I characteristics of a PN junction diode. 3
   b) Differentiate between Zener breakdown and avalanche breakdown. 2.75
   c) For the circuit shown below, find: 3
      i. Output voltage
      ii. Voltage drop across 50 K-Ohm resistor and
      iii. Voltage across the diode.



4. a) What is an Op Amp? What are the basic characteristics of an ideal OP-AMP? 3
   b) What do you mean by virtual ground of an op-amp? Explain. 1.75
   c) A 10mV, 5 KHz sinusoidal signal is applied to the input of an OP-AMP integrator as shown below for which R= 100K and C= 1μF. Find the output voltage. 4



Section-B



5. a) State and prove maximum power transfer theorem. 4.75
   b) Use Thevenin's theorem to find the current in a 20Ω load connected between the terminals A and B of the network shown in the figure- 4

6. a) What are the classification of circuit components? Define active components and passive components with examples. 2.75
   b) State and explain Kirchhoff's current law. 3
   c) Write the current division formula when only two resistance is connect in parallel. Two resistor of 4 Ω and 6Ω are connected in parallel. If the total current is 30A, find the individual current through each resistor. 3

7. a) What is an oscillator? What are the conditions for oscillation? 3
   b) What is feedback? 1
   c) Design an Astable Multivibrator whose frequency of oscillation is 5 KHz. Consider $R_1 = R_2$ and $C_1 = C_2$. 4.75

8. a) What is a rectifier? Show the circuit diagram of a full wave rectifier. 4
   b) Define voltage regulation (VR) and Peak Inverse Voltage (PIV). 2
   c) A half wave rectifier using Ge diode has secondary emf of 20 V_{p-p}. Diode forward resistance is 0.25 Ohm and load resistance is 100 Ohm. Find (i) Maximum load voltage (ii) DC load voltage and (iii) efficiency. 2.75