

University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engineering Part-I Odd Semester Examination 2020
Course Code: CSE1111 Course Title: Introduction to Computer Systems
Time: 03 Hours Full Marks: 52.5

**[N.B. Answer 06(Six) questions taking any 03(Three) questions from each section.
 The figures in the right margin indicate full marks.]**

Section-A

- | | | |
|--------|--|------|
| 1. (a) | Define computer. Explain the characteristics of computer. | 3 |
| (b) | What is meant by computer generations? Why were the first generation computers huge in size? State the features of the third generation computers. | 3.75 |
| (c) | Distinguish between mainframe and supercomputer. | 2 |
| 2. (a) | What is CPU? Draw the internal block diagram of a CPU. | 3.75 |
| (b) | Explain the importance of a bus in the computer system. What are the different types of buses found in the computer system? | 3 |
| (c) | Why cache memory is needed in a computer system? Explain it with block diagram. | 2 |
| 3. (a) | What is chipset? Explain the main activities of the chipset on a motherboard. | 3 |
| (b) | Define computer port. Give the two examples of each of serial port and parallel port. | 2 |
| (c) | What is core processor? Explain core i5 processor. Which type of RAM is used in core i5 processor? | 3.75 |
| 4. (a) | Briefly explain the types of data storage and its relation with CPU. | 3 |
| (b) | Explain the principle to store data in magnetic and optical storage devices. | 3 |
| (c) | Give a complete specification to buy a modern computer. | 2.75 |

Section-B

- | | | |
|--------|--|------|
| 5. (a) | Classify various types of Memory on the basis of the material used. | 3 |
| (b) | Explain Memory Hierarchy according to access time required for memory. | 2 |
| (c) | How many address and data lines will be there for a 16M x 32 memory system? | 1.75 |
| (d) | Explain about SSD. Discuss advantages of it. | 2 |
| 6. (a) | Explain different types of OS and also explain different types of tasks done by OS. | 3 |
| (b) | Write three utility programs with its purposes. | 2.75 |
| (c) | Explain the DOS internal structure. | 3 |
| 7. (a) | What is computer network? Give the comparison of different types of computer network. | 3.5 |
| (b) | Define topology. Explain the factors that affect choice of topology for a network. | 2.25 |
| (c) | Explain the function of following network devices (i) Router, (ii) Switch, (iii) Gateway. | 3 |
| 8. (a) | Define Malware. Explain how does it spread in computer and how does protect from it. | 2 |
| (b) | What is data processing? Explain different stages of data processing cycle. | 3 |
| (c) | What is data redundancy and data inconsistency? How DBMS is superior to conventional file processing system? | 3.75 |

University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engineering Part-I Odd Semester Examination 2020
Course Code: CSE-1121 Course Title: Structural Programming Language
Time: 03 Hours Full Marks: 52.5

[N.B. Answer 06(Six) questions taking any 03(Three) questions from each section. The figures in the right margin indicate full marks.]

Section-A

1. (a) What is meant by computer program and programming language? Why C is called structured programming language? 3
- (b) What is an identifier? What are the rules for naming an identifier? Which is not a valid C identifier from the following list and why? 3.75
(i) my name (ii) my_name (iii) struct (iv) stop! (v) void
- (c) Evaluate the following expression. Assume, int a=10, b=20, c=5, e=2; float d=4.5; 2
$$\begin{array}{l} \cancel{a+2 < b} \parallel !c \&& \cancel{a=d} \parallel a-2 \leq e \\ 12 < 20 \parallel !5 \quad 10 = 4.5 \quad 1 \leq 2 \end{array}$$
2. (a) What is run-time error? Give some examples of run-time error? 2.00
- (b) List the syntax error (if any) of each line of the following code 4.00
- ```
#includ<stdio>
void function(int y)
{
y=y*y;
return ;
}
main()
{
Intx,y;
scanf("%dd",&x,&y);
switch (x)
{
case(x<0): printf("x is positive"); break;
case(x>0); printf("x is negative");
}
x=function(y);
printf("Final value of = %d\n", x);
}
```

- (c) Can the following program sum all the numbers in the array num[ ]? If not, modify only one variable or a value in the program so that you can sum first ten numbers in the array. However, you can't update the array.

```
#include<stdio.h>
int main()
{
 int num[13]={5,10,15,20,11,30,35,40,45,50,0,65,20};
 int i=0,sum=0;
 int j=0;
 for (j=0;num[j%5];j++)
 {
 sum=sum+num[i];
 i=i+1;
 }
 printf("%3d",sum);
 return 0;
}
```

3.

- (a) What will be the output of the following code?

```
#include <stdio.h>
int a = 20;
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 main ()
{
 int a = 10;
 int b = 20;
 int c = 0;
 printf ("value of a in main() = %d\n", a);
 c = sum(a, b);
 printf ("value of c in main() = %d\n", c);
 return 0;
}
```

- (b) What will be the output of the following code?

```
#include<stdio.h>
int a,b,c;
void addint(int a)
{
 a=50;
 b=200;
 c=300;
}
```

4.25

4.50

```

int main()
{
 int b;
 c=100;
 a=40;
 printf("\n Before calling a=%d b=%d c=%d",a,b,c);
 addint(a);
 printf("\n After calling a=%d b=%d c=%d",a,b,c);
 return 0;
}

```

4. (a) Write a program to take three matrix A[n][n],B[n][n] and C[n][n] from the keyboard. Set the value of each cell of a row of the matrix D[n][n] with the largest value of respective three rows of matrix A, B and C. The maximum size of 'n' is 10. 4.50

**Sample input:**

Value of n=3

|         |          |           |
|---------|----------|-----------|
| A=1 2 3 | B= 2 3 4 | C = 1 1 2 |
| 4 5 6   | 1 2 3    | 2 3 4     |
| 2 4 5   | 7 8 9    | 6 1 2     |

**Sample output:**

D=4 4 4  
6 6 6  
9 9 9

4.25

- (b) Let a[5][5]={1 2 3 4 5  
2 3 4 5 6  
3 4 5 6 7  
4 5 6 7 8  
5 6 7 8 9 }

What will be output of the following code segment?

for (i=2; i<=4; i++)

```

{
 p=i-1;
 for (j=1; j<=4; j++)
 {if (i!=j) p=p+a[i][j]+1; else p=p+a[i][j]-1;}
 printf("%d\n",p);
}

```

## Section-B

5. (a) What will be output of the following program?

3.75

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

```
int x[5][5]={ {1, 2, 3, 4, 5},
 {6, 7, 8, 9, 7},
 {0, 1, 2, 3, 4},
 {5, 6, 2, 8, 9},
 {8, 7, 6, 5, 4} };
```

```
int i, j, k, l, tmp, big, p;
```

```
main() {
```

```
 for (i=0; i<=4; i++)
```

```
{
```

```
 for(j=i; j<=4; j++) → 0
```

```
{
```

```
 for(k=1; k<=4; k++)
```

```
{
```

```
 for(l=k; l<=4; l++) → 1
```

```
{
```

```
 x[k][l]=x[k][l]+1; → 1, 0 = 10 + 1
```

```
}
```

```
}
```

```
}
```

```
 for (i=0; i<=4; i++)
```

```
{
```

```
 for(j=0; j<=4; j++)
```

```
{
```

```
 printf ("%d ", x[i][j]);
```

```
 0 0
```

```
}
```

```
 printf ("\n");
```

```
}
```

```
getch();
```

```
}
```

- (b) 100 numbers are written in a file named input.txt. In each line, 10 numbers are written. All the numbers are separated by a single space. Write a program to determine the frequency of the numbers and write into another file named output.txt.

5.00

6. (a) Given an array of N numbers and a number K. Write a program to insert a number in the given array such that the bitwise XOR of all the elements in the new array equals the given input K. 4.50
- (b) Given an array where every element occurs three times, except one element which occurs only once. Write a program to find the element that occurs once using bitwise operators. 4.25
- Sample Input:** {12, 1, 12, 3, 12, 1, 1, 2, 3, 3}  
**Sample Output:** 2
7. (a) Define recursive function with example. What are the rules that a recursive function must have to satisfy? 2.5
- (b) Distinguish between function call by value and function call by reference. Explain with example. 2.5
- (c) Write a recursive function in C programming that will receive an integer n as input and return the sum of the digits of the number. 3.75
- Sample Input:** 1234  
**Sample output:** 10
8. (a)
- ```

vector<int> v;
v.assign(5, 10);
cout << "The vector elements are: ";
for (int i = 0; i < v.size(); i++)
    cout << v[i] << " ";
v.push_back(15);
int n = v.size();
cout << "\nThe last element is: " << v[n - 1];
v.pop_back();
cout << "\nThe vector elements are: ";
for (int i = 0; i < v.size(); i++)
    cout << v[i] << " ";

```
- (b) Write a program to display A to Z and a to z using ASCII code. 4.50

University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engineering Part-I Odd Semester Examination 2020
Course Code: CHEM1121 Course Title: Chemistry
(Session: 2019-2020)
Time: 03 Hours Full Marks: 52.5

[N.B. Answer 06 (Six) questions taking any 03 (Three) questions from each section.
The figures in the right margin indicate full marks.]

Section A

- | | |
|---|------|
| 1. (a) What is an electrolyte? Why does table salt solution conduct electricity, while sugar solution doesn't? | 1+2 |
| (b) State the Faraday's Law of electrolysis. Mention its importance. | 3 |
| (c) 0.1978g of copper is deposited by a current of 0.2 ampere in 50 minutes. What is the electrochemical equivalent of copper? | 2.75 |
| 2. (a) Define specific conductance and give its unit. | 2.75 |
| (b) 'On progressive dilution, specific conductance of an electrolyte decreases but molar conductance increases' discuss. | 3 |
| (c) Explain briefly the Debye-Huckel theory for mean activity coefficient. | 3 |
| 3. (a) What is a reference electrode? Describe the construction and working of standard hydrogen electrode. | 1+2 |
| (b) Zn gives H ₂ gas when it reacts with H ₂ SO ₄ but Ag does not. Explain (given that $E^0_{Zn^{2+}/Zn} = -0.76V$ and $E^0_{Ag^+/Ag} = 0.80V$). | 2.75 |
| (c) Discuss charge and discharge chemistry of Lead-acid storage battery. | 3 |
| 4. (a) Write Rutherford's experiment of scattering of α -particles and give the drawbacks of the model. | 3.75 |
| (b) State the postulates of Bohr theory of Hydrogen atom. | 3 |
| (c) The energy transition in hydrogen atom occurs from n = 3 to n = 2 energy level. Calculate the wavelength of the emitted electron.
Given that, R = $1.097 \times 10^7 \text{ m}^{-1}$. | 2 |

Section B

Compound

- | | |
|---|------|
| 5. (a) What are ionic, covalent, and molecular crystals? Give examples. | 3 |
| (b) Explain the term "delocalize electrons" in metal. | 1.75 |
| (c) Draw a unit cell of diamond crystal. Why diamond is non-conductor? | 2 |
| (d) Draw the layer structure of Graphite. Mention the hybridization and force belongs in that structure. | 2 |
| 6. (a) What is atomic mass of an Isotope? Why are atomic masses of most of the isotopes of a given element fractional and not whole number? | 3.75 |
| (b) What do you mean by natural radioactivity and artificial radioactivity? | 2 |
| (c) If you are given a piece of mineral, how can you determine by simple experiments if the mineral is radioactive? | 2 |
| (d) Write a reaction for α -decay. | 1 |

7. (a) What do you understand by hydrogen bonds? Classify them with examples. 2
(b) In what way metals and ionic salts conduct electricity? Explain with suitable 3
examples. electronic / electrolytic conduction CH₄ 1.75
(c) When does a bonding in a covalent compound become fully ionic? क्षेत्रभूमि (क्षी) 2
(d) Discuss the type of hybridization that exist in tetrahedral molecule. ट्रिसेक्टिव स्प³ 2
8. (a) Define transition elements. Why do transition elements show variable 1+1.5
oxidation states?
(b) What are the everyday uses of transition metals? 1.5
(c) Compare the chemistry of the lanthanides with that of the actinides. 2.5
(d) What is meant by "disproportionation" of oxidation state? Why Cu⁺ is not 2.25
stable in aqueous solution?

Stable

University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engineering Part-I Odd Semester Examination 2020
Course Code: ENG 1111 Course Title: Technical and Communicative English
Time: 02 Hours Full Marks: 35

[N.B. Answer 04(Four) questions taking any 02(Two) questions from each section. The figures in the right margin indicate full marks.]

Section-A

- | | |
|---|-----------|
| 1. (a) What is Participle? Define Complement to the Object and Direct Object with examples. | 2.75
2 |
| (b) Complete the following sentences with words/phrases/clauses: | 3 |
| (i) The girl.....on the stage is my cousin. | 15 |
| (ii) He is too tired..... | 15 |
| (iii)the girl is praised by all. | 3 |
| (iv) He works hard..... | 15 |
| (v) The news.....is false. | 15 |
| (vi) She ran fast lest..... | 15 |
| (c) Convert the words as directed and make meaningful sentences with the converted forms: | 3 |
| (i) enemy (adjective) | |
| (ii) circle (verb) | |
| (iii) reliable (noun) | |
| (iv) horror (verb) | |
| (v) unity (adverb) | |
| (vi) quote (adjective) | |
| 2. (a) Define Qualifier with example. | 0.75 |
| (b) Give meaning to and make sentences with the following idioms and phrases: | 3 |
| (i) muster strong | |
| (ii) bring to book | |
| (iii) cut short | |
| (iv) lay by | |
| (v) make out | |
| (vi) off and on | |
| (c) Transform the following sentences as directed: | 5 |
| (i) Zeeshan said, "I walk a mile everyday". (indirect) | |
| (ii) Did you eat the orange? (passive) | |
| (iii) Don't disturb the baby who is sleeping. (simple) | |
| (iv) Give me some milk to drink. (complex) | |
| (v) He is as clever as a fox. (comparative) | |

3. (a) Make sentences using the following structures (any four):

- (i) Subject + Independent clause
- (ii) Subject + Independent clause + Coordinating conjunction + Independent clause
- (iii) Subject + Verb + Subject Complement
- (iv) Subject + Verb + Direct Object
- (v) Subject + Verb + Indirect Object + Direct Object

- (b) Use appropriate modals, according to the instructions in brackets, to complete the following sentences; use negatives where necessary (any four): 4

- (i) We go for a walk now. (Indicate intention)
- (ii) I always play cricket after lunch. (Indicate habitual action)
- (iii) I pay my debts. (Expressing obligation)
- (iv) You want to eat some salads. (Indicate suggestions or predictions)
- (v) It rain. (Indicate potential of an event)

- (c) Define noun in apposition with an example. 0.75

Section-B

4.

Read the passage carefully and answer the questions that follow:

Is it possible to persuade mankind to live without war? War is an ancient institution which has existed for at least six thousand years. It was always wicked and usually foolish, but in the past the human race managed to live with it. Modern ingenuity has changed this. Either Man will abolish war, or war will abolish Man. For the present, it is nuclear weapons that cause the gravest danger, but bacteriological or chemical weapons may, before long, offer an even greater threat. If we succeed in abolishing nuclear weapons, our work will not be done. It will never be done until we have succeeded in abolishing war. To do this, we need to persuade mankind to look upon international questions in a new way, not as contests of force, in which the victory goes to the side which is most skilful in massacre, but by arbitration in accordance with agreed principles of law. It is not easy to change age-old mental habits, but this is what must be attempted.

8.75

- (a) What is the necessity of abolishing war?
- (b) How can we negotiate war?
- (c) Change the following words as directed and make a sentence with each changed form: danger (into verb); persuade (into adjective)
- (d) Make a précis of the above passage with a suitable title.

5. (a) Write an application for a job in a commercial firm. 4
- (b) Write a letter to the editor of a newspaper regarding high prices of commodities. 4.75

6. (a) Write an email informing your classmates regarding a quiz competition that is going to take place in your department. 4
- (b) Suppose you have got an offer for admission into a foreign university. Write an application to the Chairperson of your department asking for a letter of recommendation which you need for getting a scholarship. 4.75

University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engineering Part-I Odd Semester Examination 2020
Course: EEE-1131 (Basic Electronics) (2019-2020)
Time: 03 Hours Full Marks: 52.5

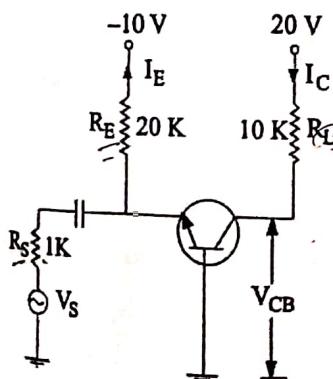
[N.B. Answer 06 (Six) questions taking any 03 (Three) questions from each section.
The figures in the right margin indicate full marks.]

Section-A

- | | |
|--|------|
| 1. (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. | 2.75 |
| (c) Consider a specimen of Silicon of length 1.5 cm and area 1 mm^2 . Calculate the
i) conductivity ii) resistivity and iii) resistance of the specimen. (Assume $n_i = 1.5 \times 10^{16}$, $\mu_e = 0.13 \text{ m}^2/\text{v-s}$, $\mu_h = 0.05 \text{ m}^2/\text{v-s}$) | 3 |
| 2. (a) What is a p-n junction diode? How can you use a junction diode as a rectifier?
Explain. | 3 |
| (b) Draw the V-I characteristic of a p-n junction diode. | 3 |
| (c) Discuss the formation of depletion layer in a PN junction diode. | 2.75 |
| 3. (a) Differentiate between Zener breakdown and avalanche breakdown. | 2 |
| (b) Show the V-I characteristics of a Zener diode. | 2.75 |
| (c) Zener diode can be used as a voltage regulator. Explain. | 4 |
| 4. (a) What is a transistor? Discuss the structure of a transistor. | 3 |
| (b) How a transistor can be used as switch? Explain. | 3 |
| (c) What do you mean by transistor biasing? Why it is required? | 2.75 |

Section-B

- | | |
|--|------|
| 5. (a) Show the relationship between α and β (in case of BJT). | 1.75 |
| (b) Draw the output characteristic of a CE amplifier and show the cut off, active and saturation region. | 3 |
| (c) Draw the dc load line and find the Q point of the following circuit. | 4 |

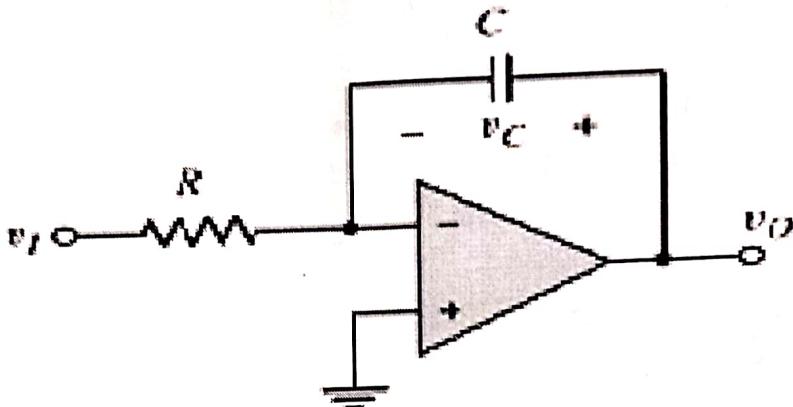


$$\begin{aligned}
 20 - 10R_1 - V_{CB} &= 2 \\
 \frac{20}{10} &\equiv 2 \\
 20 & \\
 20 + 10 & \\
 10 + &
 \end{aligned}$$

$$\alpha (\beta + 1) = \beta$$

$$\begin{aligned}
 \beta &= \frac{\beta}{\beta + 1} \\
 \frac{\beta}{\beta + 1} &= \frac{1}{2} \\
 \beta + 1 &= 2 \\
 \beta &= 1
 \end{aligned}$$

6. (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, 5KHz sinusoidal signal is applied to the input of an OP-AMP 4
 integrator as shown below for which $R = 100K$ and $C = 1\mu F$. Find the output voltage.



7. (a) What is FET and what are its types? 1.75
 (b) Describe the basic operation of a MOSFET. Define enhancement mode and 3
 depletion mode. 4
 (c) Describe the general current-voltage characteristics for both enhancement mode 4
 and depletion mode MOSFETs.
8. (a) What is a photodiode? Explain different types of photodiodes according to their 3.75
 function and structure?
 (b) Explain the V-I characteristics of a photodiode. 3
 (c) What are the applications of phototransistors? 2

University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engineering Part-I Odd Semester Examination 2020
Course Code: MATH-1121 Course Title: Differential and Integral Calculus
(Session: 2019-2020)
Time: 03 Hours Full Marks: 52.5
[N.B. Answer 06 (Six) questions taking any 03 (Three) questions from each section.
The figures in the right margin indicate full marks.]

Section-A

1. (a) Define a function, its domain and range with an example. 3
- (b) Sketch the graph of $f(x) = [x]$, where $[x]$ denotes the greatest integer not exceeding x , also find the domain and range of $f(x)$. 3
- (c) Define limit of a function $f(x)$ at $x = a$.
 Does $\lim_{x \rightarrow 0} f(x)$ exist for $f(x) = \begin{cases} 2x + 1 & \text{if } x \leq 0 \\ x^2 - x & \text{if } x > 0 \end{cases}$ 2.75
2. (a) Define the continuity of a function $f(x)$ at a point $x = a$. Discuss the continuity of the function $f(x) = \begin{cases} x^2 + 1 & \text{if } x < 1 \\ 3 & \text{if } x = 1 \\ 4 - 2x & \text{if } x > 1 \end{cases}$ at $x = 1$. 3
- (b) Define the differentiability of a function at a point $x = a$. A function $f(x)$ is defined as follows:

$$f(x) = \begin{cases} x & \text{if } 0 < x < 1 \\ 2 - x & \text{if } 1 \leq x \leq 2 \\ x - \frac{x^2}{2} & \text{if } x \geq 2 \end{cases}$$

 Discuss the differentiability of the $f(x)$ at $x = 1$. 3
- (c) Find $\frac{dy}{dx}$ from $(\cos x)^y = (\sin y)^x$. 2.75
3. (a) If $y = \sin(m \sin^{-1} x)$, then show that

$$(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} + (m^2 - n^2)y_n = 0.$$
 2.75
- (b) State Rolle's Theorem. In the Mean Value Theorem $f(a + h) = f(a) + hf'(a + \theta h)$, if $a = 1, h = 3$ and $f(x) = \sqrt{x}$, find θ . 3
- (c) Examine whether $x^{\frac{1}{x}}$ possesses a maximum or a minimum and determine the same. 3
4. (a) Define a homogeneous function and state the Euler's Theorem on homogeneous functions.
 If $u = \tan^{-1} \frac{x^3 + y^3}{x - y}$, show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$. 2.75

- (b) Show that for the curve $by^2 = (x + a)^2$, the square of the subtangent varies as the subnormal.
 (c) Prove that the asymptotes of the cubic $(x^2 - y^2)y - 2ay^2 + 5x - 7 = 0$ form a triangle of area a^2 .

Section-B

5. (a) Evaluate any three of the following integrals:

 - $\int \frac{e^x}{x} (1 + x \log x) dx$
 - $\int \frac{x}{(x-1)(x-2)} dx$
 - $\int \frac{dx}{5+4\cos x}$
 - $\int \frac{x}{x+\sqrt{x^2-1}} dx$

(b) What is the geometrical interpretation of $\int_a^b f(x) dx$? Evaluate from first principle $\int_0^1 x^2 dx$.

(c) Evaluate $\lim_{n \rightarrow \infty} \left\{ \frac{n}{n^2+1^2} + \frac{n}{n^2+2^2} + \frac{n}{n^2+3^2} + \dots + \frac{n}{n^2+n^2} \right\}$.

6. (a) Evaluate the following definite integrals:

 - $\int_8^{15} \frac{dx}{(x-3)\sqrt{(x+1)}}$
 - $\int_1^{e^2} \frac{dx}{x(1+\log x)^2}$

(b) Show that $\int_0^{\frac{\pi}{2}} \frac{1}{(a^2 \cos^2 x + b^2 \sin^2 x)} dx = \frac{\pi}{2ab}$.

(c) Use necessary properties of definite integrals to evaluate the following integrals mentioning each of the properties you used in the evaluation process:

 - $\int_0^{\frac{\pi}{2}} \frac{\sin x}{\sin x + \cos x} dx$
 - $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} (\sin x)^{51} dx$

(a) What do you mean by a reduction formula? Obtain a reduction formula for $\int \tan^n x dx$ and hence find the value of $\int_0^{\frac{\pi}{4}} \tan^4 x dx$.

(b) Define Beta and Gamma functions. Mention their applications. Show that

$$\int_0^{\frac{\pi}{2}} \sin^p \theta \cos^q \theta d\theta = \frac{\Gamma(\frac{p+1}{2}) \Gamma(\frac{q+1}{2})}{2\Gamma(\frac{p+q+2}{2})}, p > -1, q > -1.$$

(c) Evaluate the integral $\int_0^{\infty} e^{-x^2} dx$ with the aid of Gamma function.

(a) Find, by integration, the area between the curve $y = x^2 - 4$ and the x -axis.

(b) Use the concept of integrals to find the perimeter of the circle $x^2 + y^2 = a^2$.

(c) Find the volume of the solid generated by revolving the cardioid $r = a(1 + \cos \theta)$ about the initial line.