

Output

90
43.0

UNIVERSITY OF RUHUNA
BACHELOR OF SCIENCE (GENERAL) DEGREE
LEVEL I (SEMESTER I) EXAMINATION – June 2023

Subject: **Computer Science**

Course Unit: **COM1112 – Basic Concepts of Computer Science**

Duration: **2 hours**

Answer All Questions.

1.

- a) Write down the main difference between the following pairs.
 - i. Low-level programming language and High-level programming language
 - ii. System software and Application software
 - iii. Internal memory devices and External memory devices
- b) Do the following conversions. Show the intermediate steps where necessary.
 - i. Decimal number 82 to Binary
 - ii. Octal number 372_8 to Decimal.
 - iii. Hexadecimal number $A5C_{16}$ to Binary
- c)
 - i. Write down two (2) differences between Local Area Network (LAN) and Wide Area Network (WAN)
 - ii. Convert the following dotted-decimal IPv4 address to binary notation.
110.28.10.48
- d) Fill in the blanks with the most suitable term from the list given below.

(Internet Service Provider (ISP), Anti-virus, HTTPS, Domain Name System (DNS), Virtual Private Network (VPN), Authentication, HTTP, Authorization, Firewall, 4th generation computers, 5th generation computers)
 - i. provides methods for access control rights to resources limiting and controlling the use of information, systems and networks.
 - ii. is a device or set of devices designed to permit or deny network transmissions based upon a set of rules.
 - iii. provides the ability to work over both private and public networks like the Internet that does not involve public network cabling.
 - iv. allows secure ecommerce transactions on web servers and browsers.
 - v. have more than one CPU.

2.

a)

i. List down the three (3) main components of the CPU and the main functionality (01) of each of them.

ii. Write down two (2) differences between PROM and EPROM.

b) Briefly explain the following network topologies.

i. Mesh topology

ii. Bus topology

iii. Ring topology

c)

i. Write down the integer range that can be represented with **5-bits**, using the following number representations:

a. Sign-magnitude :

b. Two's complement:

ii. Perform **two's complement** operation for **(-10) - 5** using **5 bits**. Clearly show the calculation steps related to this operation.

d)

i. Define software piracy. Give two (2) examples.

ii. Write down the main difference between the following switching techniques.

a. Circuit switching and Message switching

b. Message switching and Packet switching

3.

a)

i.

b)

functionality

a)

- i. "Internal memory devices are not directly accessible by the central processing unit". Explain whether you agree or disagree with this statement.
- ii. Differentiate between DVD and Blue ray disks with three (03) facts.
- iii. Draw and name the state diagram of the basic instruction cycle with fetch cycle, execute cycle and interrupt sub cycles.
- iv. Using a suitable diagram explain how two stage pipeline works.

he

b) A one-word instruction is stored in memory at address 200. The instruction specifies the operation, mode and the address field. Assume that the address field has the value P. The content of memory address P is 100. The program counter has the value 200 for fetching this instruction. The content of processor register R is 150, and the content of an index register XR is 102. The effective address for the relative addressing mode is calculated as 608.

ow the

- i. According to the given information, determine the value of P.
- ii. Evaluate the effective address for each of the following addressing modes.

- Direct
- Indirect
- Register indirect
- Indexed

4.

a)

- i. "In sequential circuits, output depends on both present and past inputs". Explain whether you agree or disagree with this statement.
- ii. Using a suitable diagram explain how SR flip flop works considering all input combinations.
- iii. Simplify the following boolean expression. Show the steps.
$$(A+B).(A'+C).(B+C)$$

b) Assume that there is a lamp to indicate whether a manufacturing process is complete or not. You are asked to design a logic circuit for this system that has three inputs P, Q and R which indicate the stages of the manufacturing process and one output Z which indicates that the manufacturing process is complete (lamp is switched on). If input R has the value 1, then output Z has the value of P. If the output R is zero, then output Z has the value of Q.

- i. Develop a truth table for the inputs (P, Q, R) and output Z.
- ii. Express output 'Z' in product of sums form.
- iii. Simplify the expression you wrote for 'Z' in 4) b) ii) using k-maps.