RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

Bachelor of Science in Applied Sciences
Second Year - Semester I Examination - July/August 2023

PHY 2208 – GRAPHICAL PROGRAMMING FOR PHYSICS

Time: Two (02) hours

Answer All Questions

Instructions:
You are needed to;

- **Prepare a word document (answer script) including all screenshots of your codes(Block diagrams and the Front Panels) and outputs with all VIs and Sub VIs.**
- **Name your word document with your index number.**
  Ex: <index_no.docx/doc>
- **Name your VI with question number**
  Ex: Question number 1part a: Q_01_a

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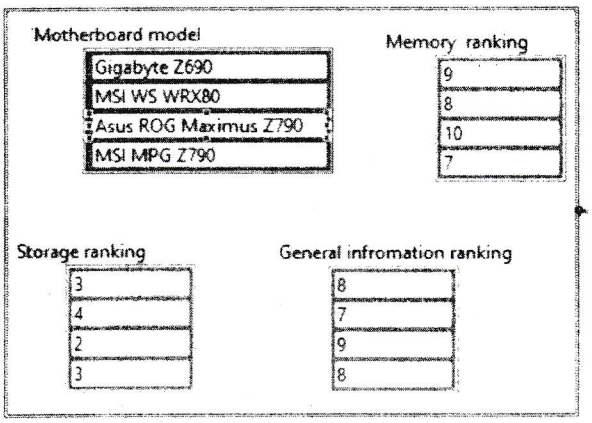
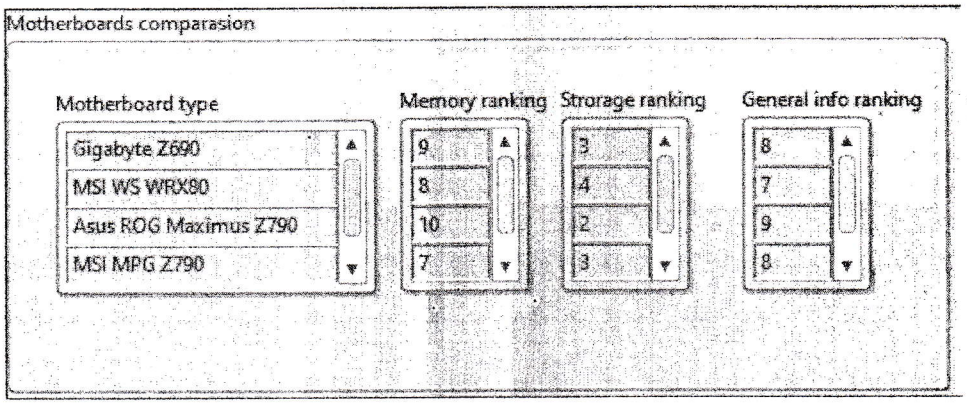
1. The following constant cluster is an input of a lab-view program.



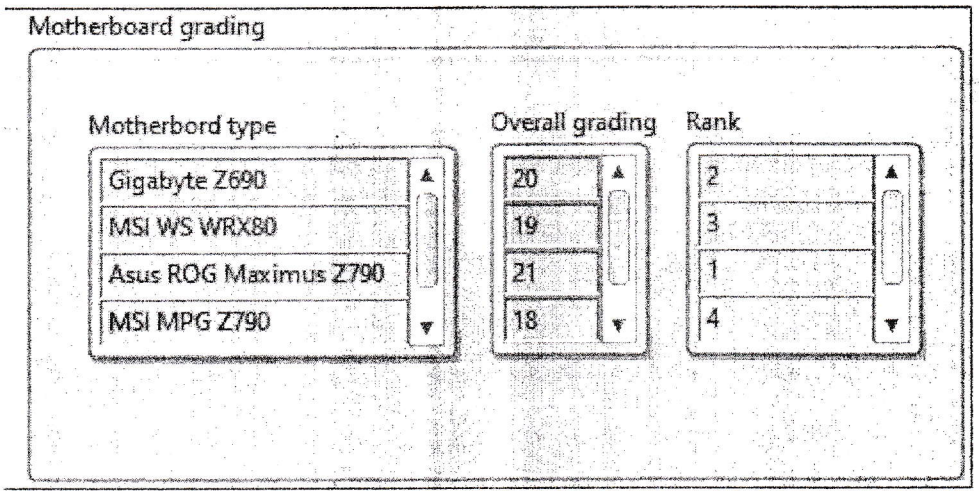
a) Create the above cluster in the **block diagram** using arrays and clusters. **(05 Marks)**

b) Using the cluster created in **part (a),** create the following front panel to **display the details**. **(05 Marks)**

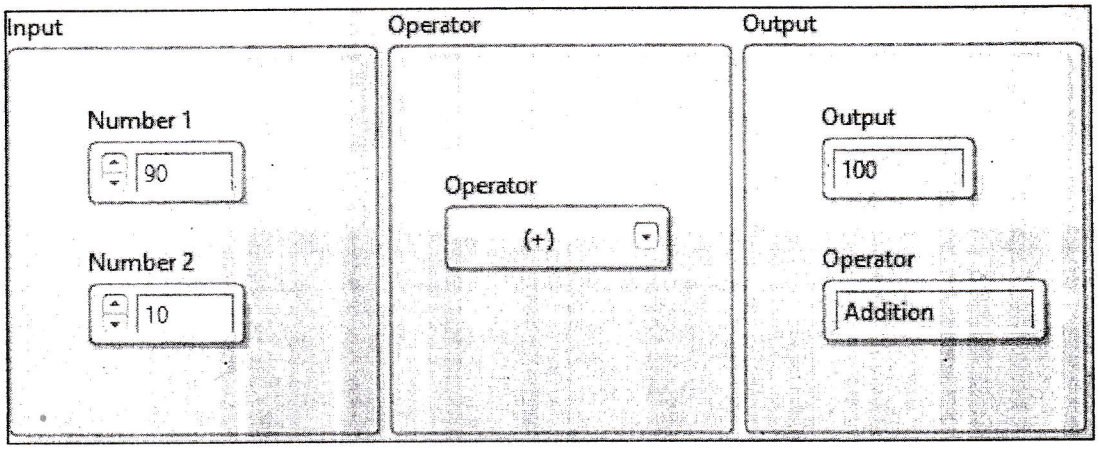


c) Using the **cluster in part (a)** as the input, calculate the **Overall Grading** of each motherboard and then find the overall rank using the calculated overall grading.
(Hint: Overall Grading = Memory ranking + Strorage ranking + General info ranking.)

(20 Marks)



2. A student is trying to implement a calculator as shown below.



a) Create the above front panel in the LabView program. **(04 Marks)**

b) Using the created front panel, construct **Addition, Subtraction, Division**, and **Multiplication** of two numbers using the **menu ring**. Obtain the values from **each operator** for the given **two numbers** (Number 1 → 90, Number 2 → 10). **(15 Marks)**

c) Let's assume that you want to automate the calculator. **List two structures** that can be used to improve this application. **(04 Marks)**

d) State **one change** that can be done to the front panel after automating the calculator. **(02 Marks)**

3.

a) The spectral radiance of a body is given by the following equation. Construct the equation using **Mathscript node.** (08 Marks)

$$B = \frac{2hv^3}{c^2} \frac{1}{e^{\left(\frac{hv}{kT}\right)} - 1}$$

where,

B – Spectral radiance of a body
v – Frequency
T – Absolute temperature
k – Boltzmann constant ($k = 1.381 \times 10^{-23}\ m^2\ Kg\ S^{-2}\ K^{-1}$)
h – Plank constant ($h = 6.626 \times 10^{-34}\ m^2\ Kg\ S^{-1}$)
c – Speed of light in the medium ($c = 3 \times 10^8\ ms^{-1}$)
(k,h,c are constants)

Find **B** when v = 320 Hz and T = 300.15 K. **(05 Marks)**

b) Solve the following equation using **Formula Node**. **(12 Marks)**

$$f(x) = \frac{\ln(ax^2+bx+c)-\sin(ax^2+bx+c)}{4\pi x^2+\cos(x-2)(ax^2+bx+c)}$$

where,

$a = 5,\ b = 5,\ c = 10,\ x = 8$

4.

a) Using the **MathScript window,** plot the following equations in the **same graph**. **(12 Marks)**

$$y_1 = A\cos(t) + 2\sin(\sqrt{2At})$$
$$y_2 = A\sin(0.5t) + 4\cos(\sqrt{9At})$$

where, $A = 5$ (a constant), t = Time.

The time vector starts at $\boldsymbol{t = 0}$ **and ends at** $\boldsymbol{t = 20}$ **with** $\boldsymbol{0.1s}$ **gaps**. Label x-axis as "Time", y-axis as "Y1 and Y2". Add the title as "Y1 and Y2 vs t". Add a **legend for each graph** as "Y1" and "Y2". **Turn on** the grid. The legend "**Y1**" containing line should be **red** and "**Y2**" containing line should be **green**.

What are the local variables you can observe in this script? **(03 Marks)**

b) Using any preferable method create a VI that can calculate the T_c value for given T_F value.

$T_F = \frac{9}{5}T_c + 32$, where, $T_F = 25$. **(05 Marks)**

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