NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA FACULTY OF SCIENCES

## DEPARTMENT OF PURE AND APPLIED SCIENCE

## 2021_1 EXAMINATIONS

COURSE CODE:
COURSE TITLE:
CREDIT UNIT:
TIME ALLOWED:
INSTRUCTION:

PHY492
LABORATORY PHYSICS III
3
( $\mathbf{2}^{1} / 2$ HRS)
Answer question 1 and any other four questions

QUESTION 1
A student carried out a light experiment and got the following readings:

| Distance of object <br> from lens Ucm | Distance of image <br> from lens V cm |
| :--- | :--- |
| 14.00 | 50.00 |
| 18.00 | 32.00 |
| 26.00 | 20.00 |
| 40.00 | 16.00 |
| 55 | 13.00 |

a. Evaluate:
i. $(u+v) \mathrm{cm} \quad 1 \mathrm{mk}$
ii. (uv) ${ }^{2}$ for each experiment 1 mk
b. Tabulate your readings 1 mk
c. Plot a graph of $(u+v)$ against $(u v)^{2} \quad 3 m k$
d. Determine the slope x 1 mk
e. What is $\frac{1}{x} \quad 2 \mathrm{mks}$
f. Calculate the error from the slope 2 mks
g. What is the radius of curvature $r$ of the lens 1 mk
h.

## QUESTION 2

a. Sketch the diagram for demonstration of half wave rectification 3mks
b. Describe how the set up in 7a explains the action of the diode 3 mks
c. Does the connection to CRO affect the A.C. wave form? If so how 4 mks
d. What is the effect of connecting capacitors parallel to R when S is open 2 mks

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## QUESTION 3

A student carried out an experiment to determine the real and apparent depth of a liquid and hence the refractive index. He used the travelling microscope method and obtained the following readings

Microscope readings

| di $\mathbf{~ m m}$ | do $\mathbf{~ m m}$ |
| :--- | :--- |
| 7.0 | 2.0 |
| 8.0 | 2.5 |
| 9.0 | 3.0 |
| 10.11 | 3.3 |
| 12.0 | 4.0 |

If $\mathrm{di}=$ real depth and upward apparent displacement is do;
i. Calculate the apparent depth $=\mathrm{d}_{2}=\mathrm{d}_{1}-\mathrm{d}_{0} 2 \mathrm{mks}$
ii. $\mathrm{X}=\frac{\text { Real depth }}{\text { Apparent depth }} \quad 2 \mathrm{mks}$

## QUESTION 4

A student made 6 observations, he used signal generator, capacitor, inductor, voltmeter, ammeter and oscilloscope to perform an experiment. The output voltage was constant at 12 V . The readings were:

| Resistance R(几) | Current I (A) |
| :--- | :--- |
| 20 | 8.00 |
| 40 | 7.20 |
| 60 | 6.50 |
| 80 | 5.00 |
| 100 | 4.50 |
| 120 | 3.80 |

a. Tabulate your readings 1 mk
b. Evaluate $\mathrm{V} / 1=\mathrm{Z} \quad 1 \mathrm{mk}$
$Z^{2} 1 \mathrm{mk}$
$\mathrm{R}^{2} \quad 1 \mathrm{mk}$
c. Plot a graph $Z^{2}$ on the vertical axis $\& R^{2}$ on the horizontal 4.5 mk
d. Determine the slope 2 mk
e. Find the error in the slope 1.5 mk

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## QUESTION 5

In an optics experiment, a student got the following results from measurement:

| $\mathbf{d ~ c m ~}$ | $\mathbf{L}_{\mathbf{1}} \mathbf{c m}$ | $\mathbf{L}_{2} \mathbf{~ c m ~}$ |
| :--- | :--- | :--- |
| 90 | 75.6 | 55.6 |
| 80 | 62.6 | 25.6 |
| 70 | 59.0 | 23.0 |
| 60 | 46.5 | 21.4 |
| 50 | 33.0 | 20.9 |
| 40 | 20.0 | 25.0 |

a. Evaluate the following and tabulate your readings

- $\mathrm{L}=\left(\mathrm{L}_{1}-\mathrm{L}_{2}\right) \quad 1 \mathrm{mk}$
- $\mathrm{L}^{2} \quad 1 \mathrm{mk}$
- $\mathrm{d}^{2} \quad 1 \mathrm{mk}$
- $\mathrm{D}=\left(\mathrm{d}^{2}-\mathrm{L}^{2}\right) 1 \mathrm{mk}$
b. Plot a graph of D on the vertical axis and d on the horizontal axis 4 mk
c. Determine the slope 2 mk
d. Calculate the error in the slope 1 mk
e. Evaluate S/2
where
1 mk
S = slope


## QUESTION 6

a. $\quad \mathrm{X}_{\mathrm{C}}=\frac{1}{2 \pi f c}, \mathrm{X}_{\mathrm{L}}=2 \pi \mathrm{fl}$. Explain the symbol (3mk)
b. What is the difference between resistance $\mathrm{R}, \mathrm{X}_{\mathrm{C}}$ and $\mathrm{X}_{\mathrm{L}} 3 \mathrm{mks}$
c. List 3 types of transistor configuration used in electronic circuit designs 1.5 mk
d. If the current gain in the common emitter npn transistor is given as $\beta=\Delta \mathrm{I}_{\mathrm{C}} / \Delta \mathrm{I}_{\mathrm{B}}$. Show that the voltage gain is $\mathrm{Av} .=\beta \mathrm{R}_{\mathrm{C}} / \mathrm{R}_{\mathrm{b}} \quad$ (4.5mk)
e.

