

OFFICE OF THE DEPUTY PRINCIPAL  
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

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# UNIVERSITY EXAMINATIONS

## 2020 /2021 ACADEMIC YEAR

### THIRD YEAR SECOND SEMESTER MAIN EXAMINATION

## FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

**COURSE CODE: PHY 324E**

**COURSE TITLE: DIGITAL ELECTRONICS AND DEVICES**

**DATE: 21/07/2021**

**TIME:1300 – 1600 HRS**

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### INSTRUCTION TO CANDIDATES

- SEE INSIDE

**THIS PAPER CONSISTS OF 3 PRINTED PAGES**

**PLEASE TURN OVER**

**SUPPLIMENTARY- EXAM**

## PHY 324E ELECTRONIC INSTRUMENTATION AND DEVICES

STREAM: BED (Science)

DURATION: 3 Hours

**INSTRUCTIONS TO CANDIDATES**

- i. Answer **TWO** questions in section A and any other **THREE** questions in section B.

**SECTION A (28 MARKS)****Question One (14 Marks)**

- (a) Based on band theory of solids, explain why semiconductors are preferred to solids in the construction of electronic devices (2 Marks)
- (b) Explain how p-type semiconductors are created by doping method (2 marks)
- (c) State the four types of multivibrators (4 Marks)
- (d) What are Asynchronous sequential logic (3 Marks)
- (e) Explain how an Op-Amp Controls Bandwidth (3 Marks)

**Question Two (14 Marks)**

- (a) What are monolithic IC (2 Marks)
- (b) State three classification of shift register counters based on feedback (3 Marks)
- (c) List two types of memories (2 Marks)
- (d) What is an Op-Amp? (2 Marks)
- (e) Highlight any five characteristics of an ideal OP-AMP (5 Marks)

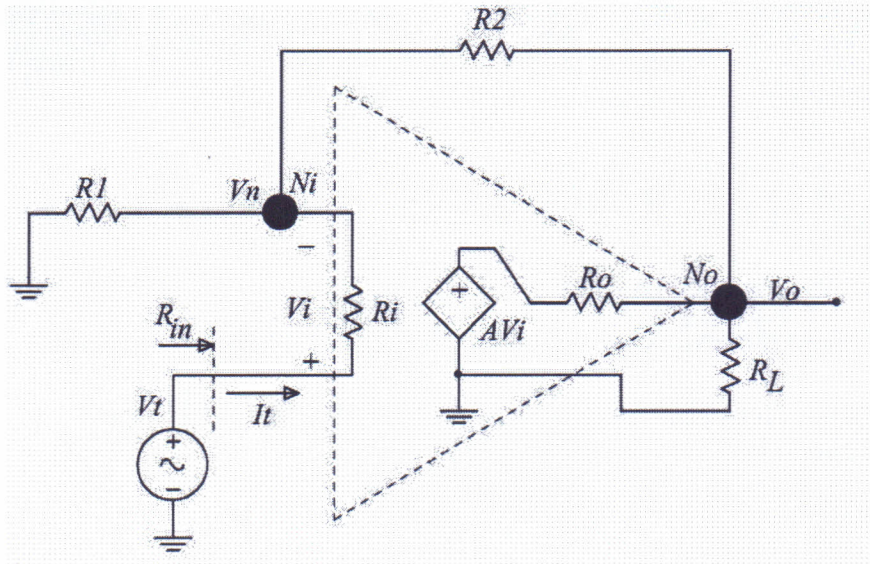
**Question Three (14 Marks)**

- (a) Op-AMPs have been widely applied in various applications. Using relevant circuit diagrams, explain the operation of the following devices relevant voltage equations
- (i) Differential amplifier (6 Marks)
- (ii) Integration amplifier (6 Marks)
- (b) Draw the voltage transfer characteristics for an Op-Amp (2 Marks)

**Question Four (14 Marks)**

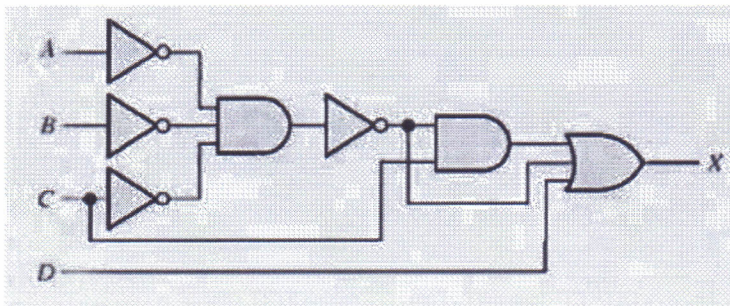
- (a) Figure below shows the equivalent non-inverting amplifier circuit for the calculation of the

input resistance  $R_{in}$ .



Show that the input resistance  $R_{in} = \frac{R2(1+\frac{Ri}{R1})+Ri(1+A)}{1+\frac{R2}{R1}}$  where the symbols have their usual meanings (9 marks)

(b) Reduce the combinational logic circuit in Figure below to a minimum form.



(5 Marks)

**Question Five (14 Marks)**

- (a) With aid of a diagram explain the Response curve for an audio amplifier (6 Marks)
- (b) Explain the concept of Feedback as used in Op-Amps (2 Marks)
- (c) Describe two main feedbacks used in Op-Amps (6 marks)

**Question Six (14 Marks)**

- (a) (i) What are **Thyristors** in digital electronics? (2 Marks)
- (ii) State the three widely used thyristors in electronics (3 Marks)

- (b) On a common Cartesian plane, draw the output characteristics curve for a typical Bipolar Transistor and in the diagram, indicate the following parameters: Cut-off region, active region, saturation region, load line, Q-point (6 Marks)
- (c) Explain the Load line and Q-point parameters in the diagram above (3 marks)

**Question Seven (14 Marks)**

- (a) Outline any three properties of semiconductors (3 Marks)
- (b) With aid of a diagram explain the reverse characteristics for a junction diode (6 Marks)
- (c) What are Counters in digital electronics? (2 Marks)
- (d) List any three classes of counters (3 Marks)

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