



**COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY (CEST)
SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING**

CERTIFICATE IV IN ELECTRICAL ENGINEERING-STAGE 4

EEE448- ELECTRONICS FOR ELECTRICIANS 2

FINAL EXAMINATION – PENSTER 2, 2014

TIME ALLOWED: 2HRS

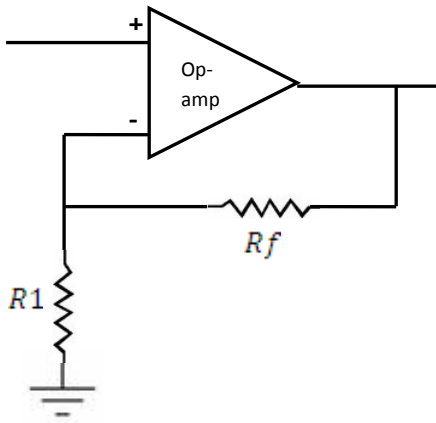
INSTRUCTIONS TO STUDENTS

1. You are allowed **10 minutes** extra **reading time** during which you are **NOT** to write.
2. Begin each answer on a fresh page and use both sides of the sheet.
3. Write your candidate number at the top of each attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with a string.
5. For all sheets of paper on which rough/draft work has been done, cross it through and **ATTACH** these to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Use of a programmable calculator is prohibited.
8. Attempt **ALL** questions.
9. Attach **page 13** with the **Answer Booklet**.

SECTION A**Multiple Choice****[30 marks]**

Select the best answer from the options given by circling the letter (A, B, C or D) in the matrix supplied at the end of the Question Paper and attach to your Answer Booklet.

1. Calculate the overall voltage gain of the circuit if $R_1 = 30\Omega$ and $R_f = 3k\Omega$



- a) -10
b) -100
c) 111
d) 90
2. How many diodes are found in single phase full – wave Bridge rectification?
- a) 2
b) 4
c) 1
d) 8
3. If the supply frequency of a single phase is 50 hertz, the ripple frequency of a half - wave rectifier is:
- a) 100 Hz.
b) 12.5 Hz.
c) 25 Hz.
d) 50 Hz.
4. What is the output voltage of the fixed regulator type?

7924

- a) -792 V
- b) +12 V
- c) +24 V
- d) -24 V

5. What is the slew rate of an op-amp if the output voltages change from 2 V to 3 V in 0.2ms?

- a) 5 V/ms
- b) 3 V/ms
- c) 2 V/ms
- d) 1 V/ms

6. What is the first procedure when troubleshooting any equipment?

- a) Signal injection.
- b) Visual check.
- c) Powering the equipment on.
- d) Visualising the waveform by using a CRO.

7. The 4-layer (Shockley) diode can conduct current if

- a) the anode-to-cathode voltage exceeds V_{BR}
- b) a current pulse is applied to the gate
- c) both a and b are correct
- d) none of the above

8. Troubleshooting a digital circuit by means of a _____ is the most reliable test instrument used to measure the high and low levels.

- a) Signal Generator.
- b) CRO.
- c) DMM.
- d) Logic Probe.

9. A voltage follower op – amp has its output connected directly to

- A) ground
- B) Supply voltage
- C) Inverting input
- D) Non – inverting input

10. The SCR can conduct current if
- a) the anode-to-cathode voltage exceeds V_{BR}
 - b) a current pulse is applied to the gate
 - c) both a and b are correct
 - d) none of the above
11. Diac and Triac are similar in that both devices
- A) can use breakover triggering
 - B) can be used in ac circuits
 - C) are bidirectional
 - D) all of the above
12. Identify the term that describes the value of the waveform that will produce the same heating effect in AC.
- a) Maximum value.
 - b) Average value.
 - c) Root mean square value.
 - d) Peak value.
13. Name the circuit used to convert AC to DC:
- a) Inverter circuit.
 - b) Rectifier circuit.
 - c) Converter circuit.
 - d) Filter circuit.
14. During troubleshooting, the appropriate test instrument; _____ is used for signal injection.
- a) CRO
 - b) Signal Generator
 - c) DMM
 - d) Both a) and b)
15. The purpose of a crowbar circuit is to protect a load from
- a) excessive ripple
 - b) low-voltage
 - c) over-voltage
 - d) all of the above
16. Which test instrument is used to measure the precise resistance of a 100 Ω resistor?
- a) CRO.

- b) Voltmeter.
- c) Ohmmeter.
- d) Ammeter.

17. Regulated DC power supplies normally have:

- a) No regulator connected after the rectifier stage.
- b) No regulator connected after the filter stage.
- c) A regulator connected before the filter stage.
- d) A regulator connected after the filter stage.

18. An application of SCR is:

- a) Motor control
- b) Time delay circuit
- c) Heater control
- d) All of the above

19. The output of an Exclusive OR gate is LOW when

- a) The either inputs are LOW
- b) The both the inputs are low or both inputs are high
- c) The input changes from LOW to HIGH
- d) Voltage is removed from the gate.

20. Which two components are commonly used in light dimmers?

- a) SCR and Diac
- b) SCR and Triac
- c) Triac and Diac
- d) MOSFET and Diac

21. To operate properly, a transistor's base-emitter junction must be forward biased with reverse bias applied to which junction?

- a) collector-emitter
- b) base-collector
- c) base-emitter
- d) collector-base

22. A transistor has a β_{dc} of 150 and a collector current, I_C , of 15mA. The Base current, I_B , equals:

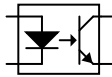
- a) 100 μ A

- b) 20 μ A
- c) 50 mA
- d) 5 A

23. Name the component that used to depend on light in order to activate and is used in Street lights, light house and household application.

- a) LDR
- b) Shockley diode
- c) LASER
- d) LED

24. Name the component used to interface two circuits of different current magnitudes.



- a) LED
- b) Photo transistor
- c) LED and photo transistor
- d) Opto-coupler

25. The output of an AND gate is HIGH

- a) All the time
- b) When all inputs are HIGH
- c) When any input is HIGH
- d) When all inputs are LOW

26. Identify the transformer used in transmitters.

- a) Matching transformer
- b) Radio Frequency Transformer
- c) Audio Frequency transformer
- d) Power Transformer

27. Identify the transformer used in hotel room speakers.

- a) Matching transformer
- b) Radio Frequency Transformer
- c) Audio Frequency transformer
- d) Power Transformer

28. The Boolean expression $X = \overline{A \cdot B}$ is logically equivalent to what single gate?

- a) NAND
- b) NOR
- c) AND
- d) OR

29. If you have to measure current, which selection will you choose?

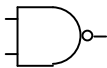
- a) Ammeter
- b) Ohmmeter
- c) Voltmeter
- d) Capacitance meter.

30. Choose the best test instrument that has a multi – selection applications for measuring any quantity instead of having more than one test instrument.

- a) CRO
- b) Multimeter
- c) Ammeter
- d) Ohmmeter

SECTION B: Matching

[10 marks]

1	Block diagram	A	Instrument that visualizes any waveform
2	Circuit Diagram	B	240 Vac to 12 Vac
3	Component layout diagram	C	- 24 V
4	Soldering	D	
5	Step down transformer	E	Shows the stages of any equipment by the indications of arrows
6	NAND gate	F	Bonding of two metals
7	Focus Knob	G	Volts/division knob

8	7924	H	Shows the physical sizes of the components onto a PCB
9	Make trace to increase or decrease in amplitude	I	Part of the CRO that functions as a trace clarity knob
10	Cathode Ray Oscilloscope	J	Shows a design in a logical fashion that contains component symbols

SECTION C: Definitions, Statements of Facts, & Formulas [20 marks]

1. List Four (4) characteristics of a practical Op-amp. [4 marks]

2. The Cathode Ray Oscilloscope (CRO) has several applications. Name any 4 of them.

(4 marks)

3. Fill in the blank spaces.

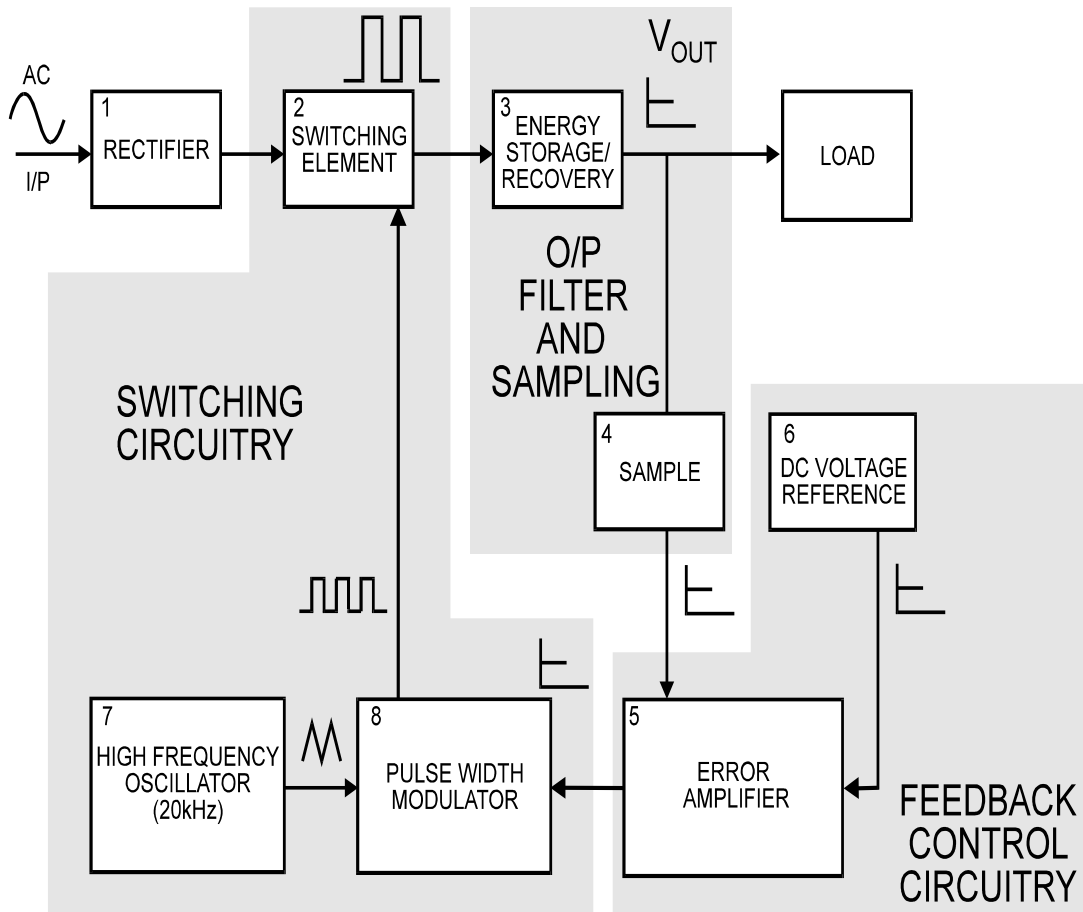
Name of the Test Equipments	Function	Operating Parameters (Voltage / Current)	Application of such Test Meters/Equipments
Series Test Lamp			
Clamp meter			
Neon Test Lamp (Screwdriver)			
Logic Probes			

(4 marks)

4. For the block diagram of the switched mode power supply given below, explain the functions of the following blocks:

- i) Switching Element **(2 marks)**
- ii) Error amplifier **(2 marks)**
- iii) High frequency Oscillator **(2 marks)**
- iv) Pulse width modulator **(2 marks)**

Block Diagram of Switched Mode Power Supply

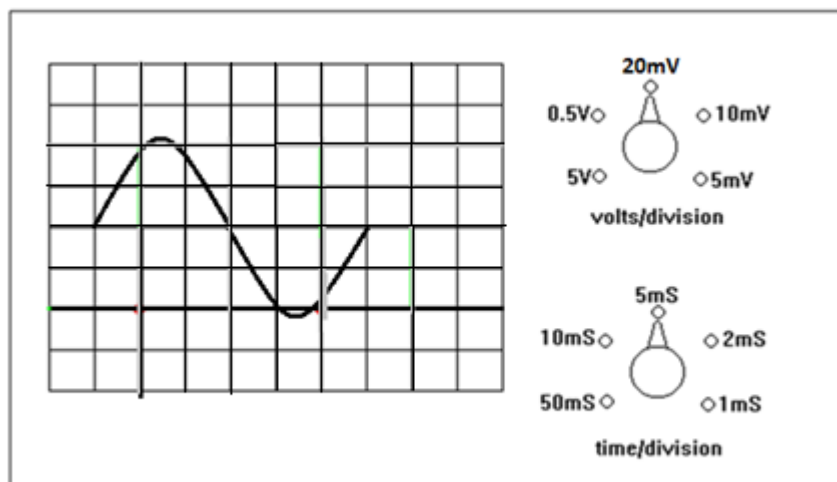


Section D

Sketches, Analysis & Operation

[40 Marks]

1. From the given diagram, calculate the:



- a) Time for one cycle **(1 mark)**
- b) Frequency **(1 mark)**
- c) V_{P-P} **(1 mark)**
- d) V_P **(1 mark)**
- e) V_{RMS} **(1 mark)**

2. List three (3) comparison of Digital and Analogue meters **(3 marks)**

3. With the use of suitable sketches clearly describe the operation of a **Full-Wave Bridge Rectifier circuit**.

(Marks: Cct-2, Waveforms-2, Operation-2) **(6 marks)**

4. **Fig - 4a** below shows a circuit diagram of an Op-Amp circuit.

- i) Identify the circuit. **(1 mark)**
- ii) Calculate the **output Voltage (V_o)**. **(3 mark)**

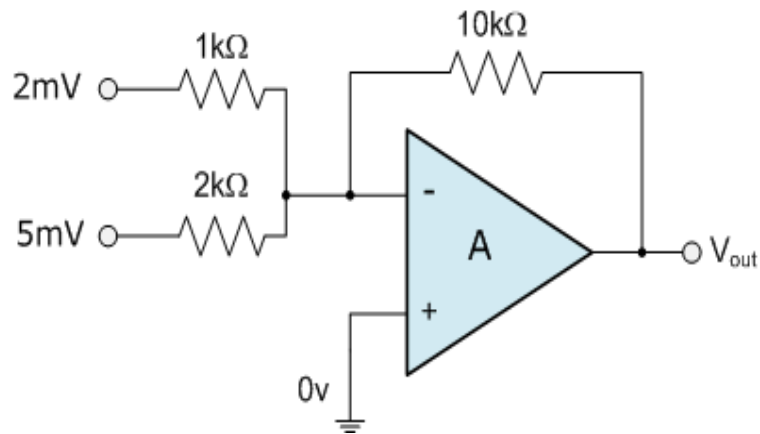
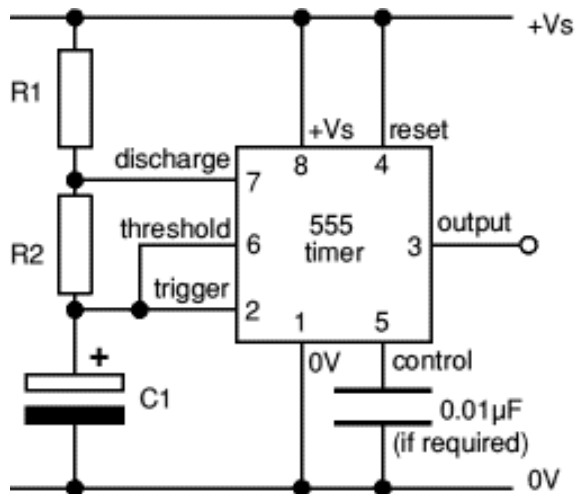


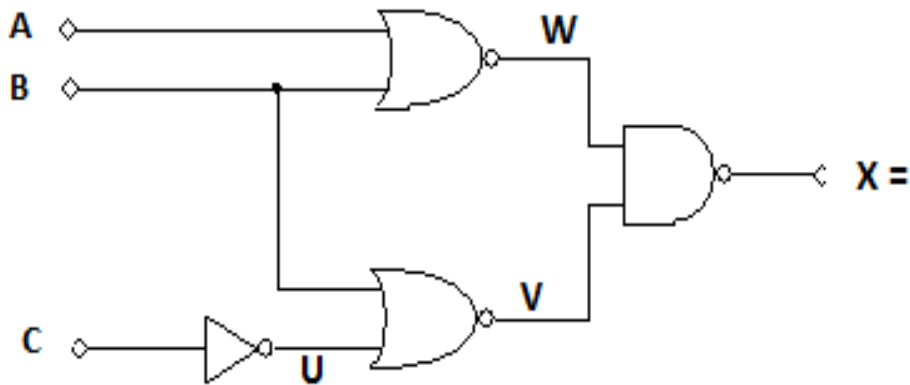
Fig - 4a

6. A certain circuit is given:

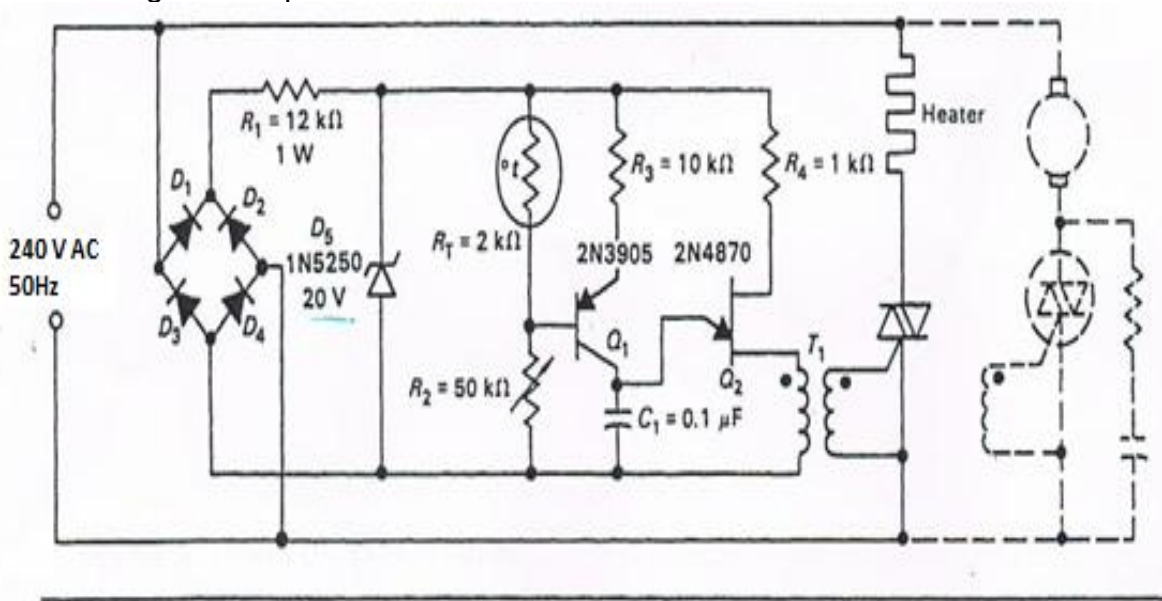


- a) Identify the application. **(1 mark)**
- b) What is the frequency of the O/P signal if $R1 = 1 \text{ k}\Omega$, $R2 = 10 \text{ k}\Omega$ and $C1 = 0.1 \text{ }\mu\text{F}$? **(3 marks)**

7. Draw the truth table and determine the output (**X**) of the combination circuit given below. **(7 marks)**



8. Refer to diagram for question below:



- Identify the circuit above. (1 mark)
- Draw the block diagram of the circuit above. (3 marks)
- Identify and explain the function of the following components:
 - D_5 (1 mark)
 - R_T (1 mark)
 - Q_2 (1 mark)
 - T_1 (1 mark)

- State the purpose of a filter in a DC power supply. (1mark)
 - Sketch a basic LED voltage indicator, showing typical voltages and currents. (2 marks)

THE END

Candidate No:

Section A

Multiple-Choice Matrix

[30 marks]

Circle correct letter (A, B, C or D) against each of numbers 1 through 30.
Remove and attach to your Answer Booklet.

1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D
11.	A	B	C	D
12.	A	B	C	D
13.	A	B	C	D
14.	A	B	C	D
15.	A	B	C	D
16.	A	B	C	D
17.	A	B	C	D
18.	A	B	C	D
19.	A	B	C	D
20.	A	B	C	D
21.	A	B	C	D
22.	A	B	C	D
23.	A	B	C	D
24.	A	B	C	D
25.	A	B	C	D
26.	A	B	C	D
27.	A	B	C	D
28.	A	B	C	D
29.	A	B	C	D
30.	A	B	C	D