ELECTRONICS

SCHEME OF EXAMINATION

There will be three papers, Papers 1, 2 and 3 all of which must be taken. Papers 1 and 2 will be a composite paper to be taken at one sitting.

PAPER 1: Will consist of fifty multiple choice objective questions all of which must be answered within 1 hour for 50 marks.

PAPER 2: Will consist of seven short-structured questions. Candidates will be required to answer five questions within 1 hour for 50 marks.

PAPER 3: Will be a practical test. The paper will consist of two questions. Candidates will be required to answer both questions within 3 hours for 100 marks.

Alternative to Practical Test

Alternatively, Council may consider testing candidates' familiarity with the practical work in the syllabus in the event of constraints on requisite facilities. This test shall consist of two compulsory questions to be answered within 2 hours for 100 marks.

SAMPLE QUESTIONS

PAPER 1

OBJECTIVE TEST

1. Damping in a moving-coil meter is obtained by the
    A. eddy currents in the magnet.
    B. action of the hairsprings.
    C. eddy currents I the core former.
    D. interaction of the coil current and the magnetic flux.

2. In pentode valve, the suppressor grid is provided to suppress
    A. grid current.
    B. stray current.
    C. secondary emission.
    D. inter-electrode capacitance.

3. Which of the following instruments is used to measure power in a circuit?
    A. Multimeter
    B. Ohm meter
    C. Watt-hour meter
    D. Voltmeter

4. The current in a reverse-biased junction diode is due to
   A. both holes and electrons.
   B. acceptor holes.
   C. majority carriers.
   D. minority carriers.

5. The majority and minority charge carriers in pnp transistors are respectively
   A. electrons and holes.
   B. electrons and protons.
   C. holes and electrons.
   D. holes and neutrons.

6. An electric bulb rated 60 W was connected to a voltage source of 240 V. Calculate the current, I that passes through the bulb.
   A. 0.004 A
   B. 0.040 A
   C. 4.000 A
   D. 40.000 A

7. The power expended when a current of 10 A flows through an electric iron of resistance 30 Ω is
   A. 300 kW.
   B. 3 kW.
   C. 30 W.
   D. 3 W.

8. The equivalent resistance of two resistors of equal value connected in series is the
   A. sum of their resistances.
   B. product of their resistances.
   C. reciprocal of the product of their resistances.
   D. reciprocal of the sum of two resistances.

9. The true power in an a.c. circuit is given by
   A. VI cos θ.
   B. VI sin θ.
   C. VI.
   D. I^2V.

10. Transformer coupling in power amplifiers provides
    A. circuit cooling.
    B. impedance matching.

    C. distortion less output

    D. improved frequency response.

11. Push-pull circuit is used for the operation in
    A. class A amplifier.
    B. class B amplifier.
    C. class C amplifier.
    D. class AB amplifier.

12. Which of the following devices in **not** a d.c. source of energy?
    A. Battery
    B. Cell
    C. Generator
    D. Photo cell

13. The decimal equivalent of the binary number 1000_2 is
    A. 12.
    B. 11.
    C. 9.
    D. 8.

14. Modulation is a process in which
    A. radio signal travels between transmitter and receiver.
    B. telephone subscribers are connected to each other.
    C. audio signals are carried over radio waves.
    D. audio signals are amplifier.

15. Which of the following equipment operate on a closed-loop system?
    A. Immersion heater
    B. Refrigerator
    C. Electric fan
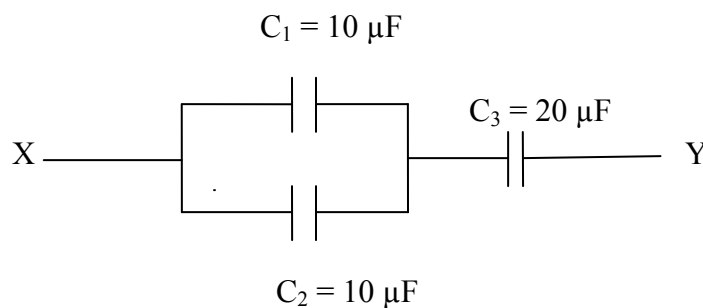   D. Electric kettle

Use figure 1 to answer Questions **16** *and* **17**.

$C_1 = 10 \ \mu F$

$C_3 = 20 \ \mu F$

X   Y

$C_2 = 10 \ \mu F$

Figure 1

16. The total capacitance between **XY** is
    A.   10.0 µF.
    B.   20.0 µF.
    C.   30.0 µF.
    D.   40.0 µF.

17. The total capacitance when C_3 is removed from the circuit is
    A. 2.0 µF.
    B. 5.0 µF.
    C. 10.0 µF.
    D. 20.0 µF.

18. The power factor of a resonant circuit is
    A. 1.0
    B. 0.5.
    C. 0.0.
    D. -1.0.

19. The rating of a battery is always expressed in
    A. Joule.
    B. Watt-hour.
    C. Ampere-hour.
    D. Ampere.

20. The primary turn of a transformer is 1000 and its secondary turn is 500. If its primary voltage is 200 V, its secondary voltage is
    A. 800.
    B. 400.
    C. 100.
    D. 50.

PAPER 2
[ESSAY]

1.(a) Draw and label the circuit diagram of a Colpitts oscillator   [6 marks]
   (b) Explain briefly the principle of operation in Colpitts oscillator.

                                                                                      [4 marks]

2. (a) With the aid of a diagram, distinguish between *dynamic* and *electrostatic transducers*.   [5 marks]
   (b) State two advantages of electrostatic transducer over dynamic transducer. [2 marks]
   (c) State three examples where electromechanical transducer can be applied. [3 marks]

3. An amplifier with an input signal of 1 mA at 10 mV and a corresponding output signal of 10 mA at 1 V. Calculate:
   (i) voltage gain;
   (ii) current gain;
   (iii) power gain.   [10 marks]

4.(a) Sketch and label the circuit symbol of the following devices:
       (i) n-channel junction field effect transistor
       (ii) thyristor;
       (iii) triac.   [9 marks]
    (b) State **one** application of any of the three devices in (a).   [1 mark]

PAPER 3
[PRACTICAL]

You are provided with the following apparatus:
one d.c. power supply (0 -12 V);
one d.c. milliammeter (0 – 100 mA);
three 10 Ω, $\frac{1}{4}$ W resistors (R_1, R_2 and R_3)

three 33 Ω, $\frac{1}{4}$ W resistors (R_4, R_5 and R_6)

one toggle switch;
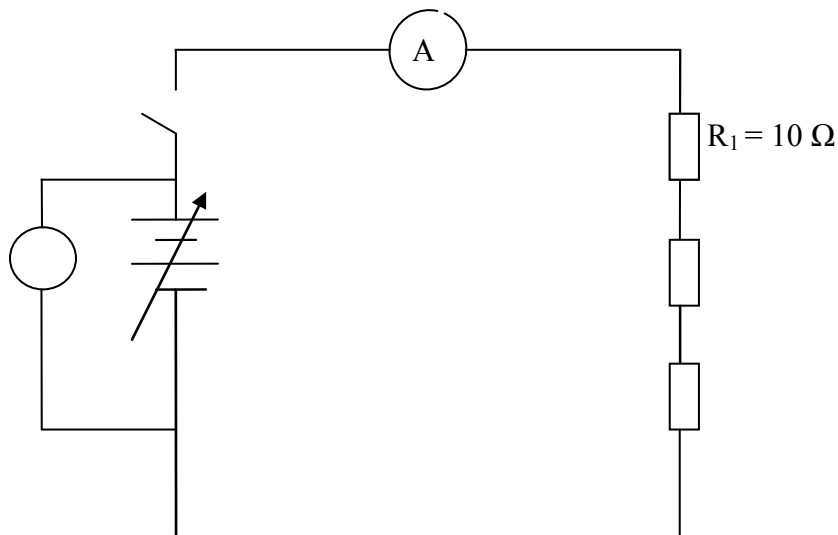**one** soldering iron with resin-cored solder;
veroboard/ quick test board;
connecting wires;
long nose pliers;
side cutter.

AIM: The aim of the experiment is to determine the equivalent resistance of a circuit.

(a) Connect the circuit as shown above.
(b) Ask the supervisor to check the circuit connection.
(c) Copy Table 1 into your answer booklet.

Table 1

Volmeter reading(V)	Ammeter reading (A)
3.0	
4.0	
6.0	
8.0	
10.0	
12.0	

(d) Close switch S.
(e) Adjust the power supply to obtain a reading of 3 V.
(f) Read and record the readings of both the voltmeter and ammeter in Table 1.
(g) Repeat steps (e) and (f) for the other voltages in Table 1.
(h) Plot a graph of voltage (V) on the y-axis against current I on the x-axis.
(i) Determine the slope (L) of the graph.
(j) State the equivalent resistance of the circuit.