FUNDAMENTALS OF ELECTRONIC MEASUREMENTS
(AEIE 3222)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) A voltmeter must have very high internal resistance so that
(a) High accuracy
(b) high resolution
(c) draw a small amount of current
(d) creates high loading effect of the circuits

(ii) A Wheatstone bridge cannot be used for precision measurements because errors are introduced into an account of
(a) thermoelectric E.M.F (b) contact resistance
(c) resistance of connecting leads (d) all of above

(iii) A bridge circuit works at a frequency of 10 kHz. The following can be used as detector for detection of null condition.
(a) Vibration galvanometer and headphones
(b) Headphones and tuneable amplifier
(c) Vibration galvanometer and tuneable amplifier
(d) Vibration galvanometer, tuneable amplifier, headphone.

(iv) The sweep generator of a CRO is used to produce
(a) Sinusoidal voltage for the horizontal deflection of electron beam
(b) Saw tooth voltage for the vertical deflection of electron beam
(c) Sinusoidal voltage for the vertical deflection of electron beam
(d) Saw tooth voltage for the horizontal deflection of electron beam

(v) The light emitted by the zinc silicate coated fluorescent screen of cathode ray tube is usually of
(a) Green colour (b) Yellow colour
(c) Blue colour (d) White colour

(vi) If the bombardment of electrons ceases i.e. when the signal becomes zero then the light emitted by the screen will
(a) Disappear immediately
(b) Persist for some time then it will disappear
(c) Will not disappear at all
(d) None of these

(vii) The Lissajious patterns help in the measurement of
(a) Phase difference between two sine wave
(b) Frequency of one waveform if the frequency of other waveform is known
(c) Both (a) and (b)
(d) None of these

(viii) If the two input waveforms f equal amplitude and 90 degree phase difference is applied to the CRO then the Lissajious patterns obtained will be
(a) Straight line tilted at 45 degree with respect to X-axis
(b) Circle
(c) Ellipse
(d) Vertical straight line

(ix) What is the peak to peak (PP) output amplitude of the triangular wave?
(a) $V_O(pp) = + V_{Ramp} + (- V_{Ramp})$ (b) $V_O(pp) = - V_{Ramp} + (+ V_{Ramp})$
(c) $V_O(pp) = + V_{Ramp} - (- V_{Ramp})$ (d) $V_O(pp) = - V_{Ramp} - (+ V_{Ramp})$.

(x) The Q meter works on the principle of
(a) Series resonance
(b) Parallel resonance
(c) Both (a) and (b)
(d) Neither series resonance nor parallel resonance.

Group – B

2. (a) What do you mean by swamping resistance? Draw and explain the multirange type ammeter.

(b) A PMMC has three resistors shunt connected across it to make an ammeter as you draw the circuit diagram in multirange type ammeter. The resistance values are R_1= 0.05Ω, R_2= 0.45Ω, R_3 = 4.5Ω, the meter has R_m =1KΩ and FSD =50 μA, calculate three ranges of the ammeter.

(2 + 5) + 5 = 12

3. (a) Sketch the circuit of two transistor based emitter-follower voltmeter. Explain the circuit operation.

(b) A two transistor based emitter-follower voltmeter circuit has $V_{cc}=\pm 12V$, emitter resistance for both the transistor=3.9 KΩ,
(i) Determine the corresponding emitter current, when E=0
(ii) Calculate the meter circuit voltage when E=1V and when E=0.5V

(3 + 3) + (3 + 3) = 12

Group – C

4. (a) Derive the equation for converting a series RC circuit into its equivalent parallel circuit. What do you mean by D factor of the capacitor?

   (b) An unknown circuit behaves as a 0.005μF capacitor in series with a 8KΩ resistor when measured at frequency of 1 KHz. The terminal resistance is measured by an ohmmeter as 134KΩ. Determine the actual circuit components and method of connection.

(5 + 2) + 5 = 12

5. (a) Derive the balance condition for the Schering Bridge with necessary circuit diagram.

   (b) Draw the basic circuit diagram of a Q meter, explain its operation and write the equation for Q factor.

8 + 4 = 12

Group – D

6. (a) Sketch the basic construction of CRT. Identify the each section of the tube and show the typical supply voltages at each appropriate point. Carefully explain the operation of CRT.

   (b) Sketch the block diagram of an automatic time base circuit for an oscilloscope.

8 + 4 = 12

7. (a) Using illustration, describe the procedure for the oscilloscope measurement of voltage, frequency and phase.

   (b) Draw the block diagram of a dual trace oscilloscope.

(3 × 3) + 3 = 12

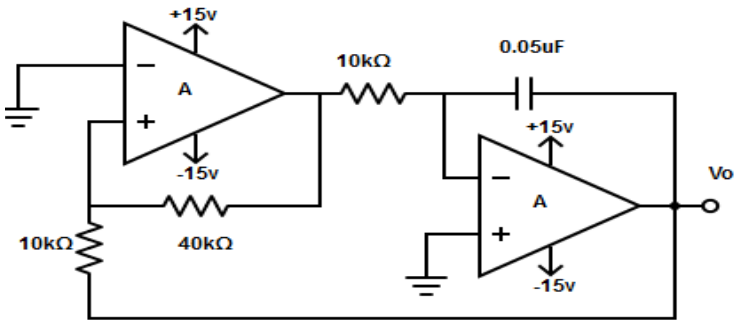
Group – E

8. (a) Derive the balance condition for the Wien Bridge Oscillator with necessary circuit diagram.

   (b) Design the above oscillator with 5 KHz oscillating frequency.

(6 + 2) + 4 = 12

9. (a)



Derive the output frequency of the above circuit diagram.

(b) Draw the output waveform. Calculate the time period and peak to peak output voltage using the data given in above diagram.

6 + (2 + 2 + 2) = 12

Department & Section	Submission Link
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