

Non-Teaching Recruitment

Question Paper

Descriptive Test (Level-2)

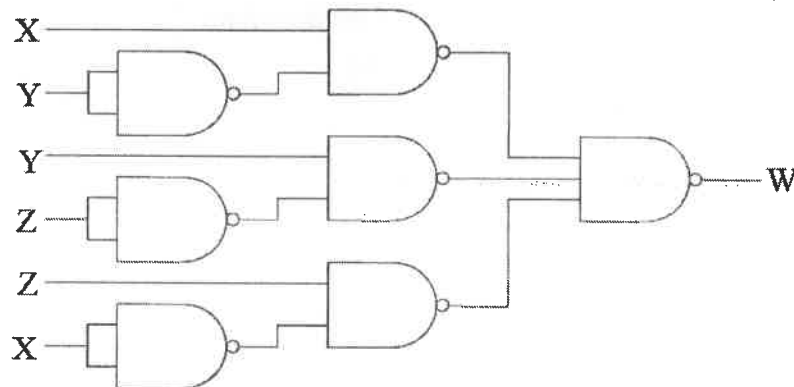
Name of the Post	:	
Application-No. _____	:	
Post	:	Junior Technician (ECE)
Date of Exam:	:	19.11.2023
Duration	:	120 Minutes
Total Marks	:	60

Instructions to the Candidates:

1. This Question paper contains **04** printed pages.
2. Candidates are not allowed to carry any paper, notes, books, gadgets etc. to the examination hall. Any candidate found using or in possession of such unauthorized materials or involved in copying or impersonation or adopting unfair means or behaviors will be disqualified and may be subjected to penal action.
3. This question paper contains two sections: Part-A and Part-B.
4. **Part-A** contains 13 questions out of which any 10 has to be answered. Each question in Part-A carries 3 marks.
5. **Part-B** contains 9 questions out of which 6 has to be answered. Each question in Part-B carries 5 marks.

PART-A (30Marks)

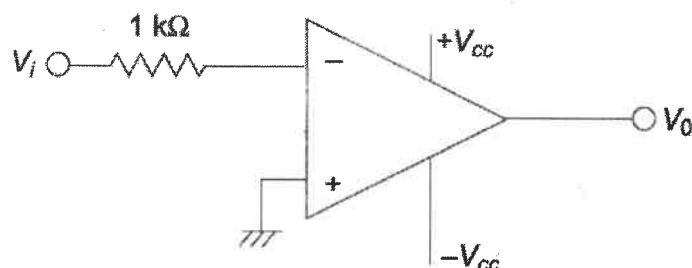
1. What is the value of shunt resistance required to convert a 1 mA meter movement with an internal resistance of $100\ \Omega$ is to be converted into a 0 – 100 mA meter.
2. Two voltmeters, one with a full-scale reading of 100 V and another with a full-scale reading of 200 V, are connected in series across a 100-V supply. The internal resistance of both meters is the same. What will be the readings of the voltmeters.
3. Write the simplified expression as sum of products form for the output (W) of combinational circuit shown in the Figure below.



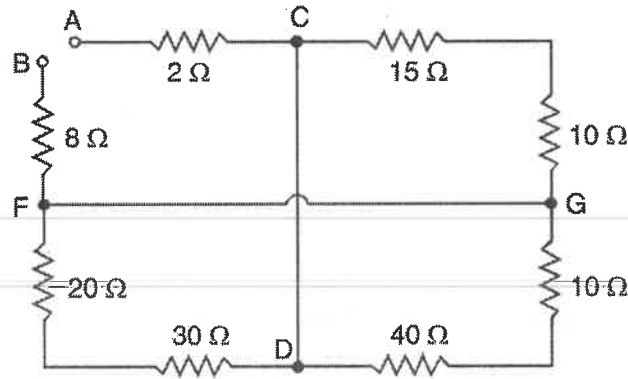
4. A Boolean expression is mapped in the K-map shown below. Derive the simplest Boolean expression in terms of the variables A, B, C, and D.

		CD			
AB		00	01	11	10
		1		1	
01	1	1	1	1	1
11	1	1		1	1
10			1		

5. Define gain bandwidth product of an operational amplifier circuit. Why does the gain of the operational amplifier decrease with increase in operating frequency?
6. Sketch the output of the operational amplifier circuit shown below. Given the input is a sine waveform of 1 Volt rms applied to the inverting terminal. Given $V_{CC}=15$ Volts.



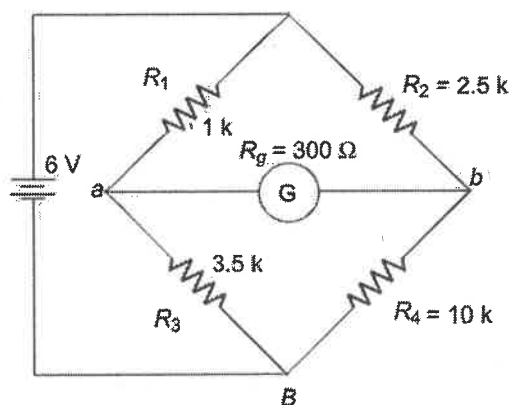
7. Sketch the instrumentation amplifier circuit using an Op-Amp and write the expression for its gain.
8. Find the resistance seen between the terminals A and B called R_{AB} in the circuit shown below.



9. A coil when connected across a 100 V d.c. supply dissipates 500 W of power. When connected across a 100 V a.c. supply of frequency 50 Hz, it dissipates 200 W. Calculate the values of resistance and inductance of the coil.
10. Consider an audio signal given by $15 \sin 2\pi (1500t)$ and modulated by a carrier signal given by $60 \sin 2\pi (100000t)$. Determine the modulation factor.
11. A 107.6 MHz carrier is frequency modulated by a 7 kHz sine wave; the resultant FM signal has a frequency deviation of 50 kHz. Find the highest and the lowest frequencies attained by the modulated signal.
12. In a transformer, the core loss is found to be 52 W at 40 Hz and 90 W at 60 Hz measured at the same peak flux density. What is the hysteresis and eddy current loss at 50 Hz.
13. A 200 kVA transformer has an efficiency of 98% at full load. If the maximum efficiency occurs at three quarters of the full load, calculate the efficiency at half load. Assume negligible magnetizing current and power factor to be 0.8 at all loa

PART-B (30 marks)

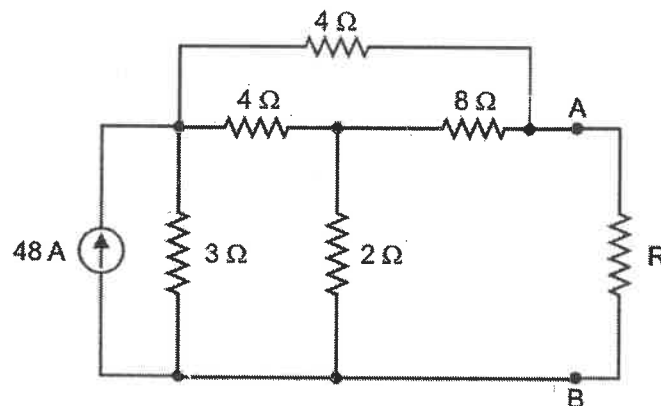
1. Find the current through the galvanometer for the Wheatstone bridge shown in the Figure below.



2. A capacitor is tested by a Schering bridge which forms one arm AB of the bridge. The other arms are AB— a non-inductive resistance of 100 Ω, AD— a non-reactive resistance of 300 Ω in parallel with a capacitor of 0.5 mF, DC — a standard loss free capacitor of 100 pF, The supply frequency is 50 Hz. The bridge is balanced. Calculate the capacitor value and the power factor of the capacitor under test.
3. Write the truth table for octal to binary encoder. Write the min-terms for each of the outputs and draw the logic diagram.

4. (a) A 10-bit A/D converter of the successive approximation type has a resolution (or quantization error) of 10 mV. Determine the digital output for an analogue input of 4.365 V.

(b) Compare the average conversion time of an eight-bit counter-type A/D converter with that of an eight-bit successive approximation type A/D converter if both are working at a 10 MHz clock frequency.
5. Construct a 4-to-16 line decoder with two 3-to-8 line decoders having active LOW ENABLE inputs.
6. Sketch the rectangular to triangular waveform generator circuit using an Op-Amp and derive the expression for output voltage (peak to peak), given the input voltage (peak-peak) as $V_i(p-p)$.
7. Sketch the circuit diagram and transfer characteristics of a Schmitt trigger using Op-Amp. Derive the expressions for Lower Trigger Point (LTP) and Upper Trigger Point (UTP).
8. In the network shown in Figure below, find the maximum power that can be provided to a resistor R connected between terminals A and B.



9. A star-connected balanced system with a line voltage of 300 V is supplying a balanced Y-connected load of 1200 W at a leading p.f. of 0.8. What is the line current and per phase impedance?
