



Non-Teaching Recruitment

Question Paper

Name of the Candidate	:	
Application No.	:	
Name of the Post	:	Technical Officer (ECE)
Exam Level	:	Screening Test (Level-1)
Date of Exam:	:	27.11.2023
Duration	:	150 Minutes
Total Marks	:	100

Instructions to the Candidates:

1. This Question paper contains printed pages with **100** questions.
2. All questions are multiple choice type questions (MCQs) with four choices (a), (b), (c), (d).
3. 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.
4. There is only one correct answer. Choose the answer from among the four options given and mark the answer by darkening the appropriate bubble marked a, b, c, or d in the attached OMR.
5. Each question carries **ONE (1)** mark only. **1 mark** will be awarded for each correct answer; **0.25** mark will be deducted for each wrong answers. (Please refer instructions given at the back side of OMR Sheet)

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1.	Two 2H inductance coils are connected in series and are also magnetically coupled to each other the coefficient of coupling being 0.1. The total inductance of the combination can be	
	(a) 0.4 H (b) 3.2 H (c) 4.0 H (d) 4.4 H	
2.	The Nodal method of circuit analysis is based on	
	(a) KVL and Ohm's law (b) KCL and Ohm's law (c) KCL and KVL (d) KCL, KVL and Ohm's law	
3.	Twelve 1Ω resistances are used as edges to form a cube. The resistance between two diagonally opposite corners of the cube is	
	(a) $5/6\ \Omega$ (b) $1\ \Omega$ (c) $6/5\ \Omega$ (d) $3/2\ \Omega$	
4.	Norton's theorem stated that a complex network connected to a load can be replaced with an equivalent impedance	
	(a) in series with a current source (b) in parallel with a voltage source (c) in series with a voltage source (d) in parallel with a current source	
5.	A source $v_s(t) = V \cos 100\pi t$ has an internal impedance of $(4 + j3)\Omega$. If a purely resistive load is connected to this source has to extract the maximum power out of the source, its value in Ω should be	
	(a) 3 (b) 4 (c) 5 (d) 7	
6.	A load, $Z_L = R_L + jX_L$ is to be matched using an ideal transformer, to a generator of internal impedance, $Z_s = R_s + jX_s$. The turn's ratio of the transformer required is	
	(a) $\sqrt{ Z_L / Z_s }$ (b) $\sqrt{ R_L / R_s }$ (c) $\sqrt{ R_L / Z_s }$ (d) $\sqrt{Z_L / R_s }$	
7.	A DC voltage source is connected across a series R-L-C circuit, Under steady state conditions, the applied DC voltage drops entirely across the	
	(a) R only (b) L only (c) C only (d) R and L combination	
8.	In a series RLC circuit $R = 2\text{ k}\Omega$, $L = 1\text{H}$ and $C = 1/400\mu\text{F}$. The resonant frequency is	
	(a) $2 \times 10^4\text{ Hz}$ (b) $1/\pi \times 10^4\text{ Hz}$ (c) 10^4 Hz (d) $2\pi \times 10^4\text{ Hz}$	
9.	If each branch of a Delta circuit has impedance $\sqrt{3}Z$, then each branch of the equivalent Wye circuit has impedance	
	(a) $Z/\sqrt{3}$ (b) $3Z$ (c) $3\sqrt{3}Z$ (d) $Z/3$	
10.	The condition $AD - BC = 1$ for a two port network implies that the network is a	
	(a) reciprocal network (b) lumped element network (c) lossless network (d) unilateral element network	
11.	The number of independent loops for a network with n nodes and b branches is	
	(a) $n - 1$ (b) $b - n$ (c) $b - n + 1$ (d) independent of the number of nodes	

12.	Superposition theorem is NOT applicable to networks containing (a) Nonlinear elements (b) Dependent current sources (c) Dependent current sources (d) Transformers	
13.	Which of the following cannot be the fourier series expansion of a periodic signal? (a) $x(t) = 2 \cos t + 3 \cos 3t$ (b) $x(t) = 2 \cos \pi t + 7 \cos t$ (c) $x(t) = \cos t + 0.5$ (d) $x(t) = 2 \cos 1.5 \pi t + \sin 3.5 \pi t$	
14.	Choose the function $f(t)$; $-\infty < t < +\infty$, for which a fourier series cannot be defined (a) $3 \sin (25t)$ (b) $4 \cos (20t + 3) + 2 \sin (10t)$ (c) $\exp(- t)\sin(25t)$ (d) 1	
15.	The Fourier series of an odd periodic function contains only (a) odd harmonics (b) even harmonics (c) cosine terms (d) sine terms	
16.	The trigonometric fourier series of an even function does not have the (a) dc term (b) cosine term (c) sine term (d) odd harmonic terms	
17.	The amplitude spectrum of a Gaussian pulse is (a) uniform (b) a sine function (c) Gaussian (d) an impulse function	
18.	If a signal $f(t)$ has energy E, the energy of the signal $f(2t)$ is equal to (a) E (b) E/2 (c) 2E (d) 4E	
19.	Which of the following is an eigen function of the class of all continuous time linear time invariant systems ($u(t)$ denotes unit step function)? (a) $e^{j\omega_0 t} u(t)$ (b) $\cos (\omega_0 t)$ (c) $e^{j\omega_0 t}$ (d) $\sin (\omega_0 t)$	
20.	The autocorrelation function of an energy signal has (a) no symmetry (b) conjugate symmetry (c) odd symmetry (d) even symmetry	
21.	The 4-point Discrete Fourier Transform of a discrete time sequence $\{1, 0, 2, 3\}$ is (a) $[0, -2 + 2j, -2-2j]$ (b) $[2, 2+2j, 2 - 2j]$ (c) $[6, 1 - 3j, 2, 1 + 3j]$ (d) $[6, -1+3j, 0, -1-3j]$	
22.	The first six points of the 8-point DFT of a real valued sequence are 5, $1 - j3$, 0, $3 - j4$, 0 and $3 + j4$. The last two points of the DFT are respectively (a) 0, $1 - j3$ (b) 0, $1 + j3$ (c) $1 + j3$, 5 (d) $1 - j3$, 5	
23.	The transfer function of a linear system is the (a) ratio of the output, $v_o(t)$, and input, $v_i(t)$ (b) ratio of the derivatives of the output and the input (c) ratio of the Laplace transform of the output and that of the input with all initial conditions zeros. (d) none of these	

24.	Non-minimum phase transfer function is defined as the transfer function (a) which has zeros in the right-half s-plane (b) which has zeros only in the left-half s-plane (c) which has poles in the right-half s-plane (d) which has poles in the left-half s-plane	
25.	The impulse response $h(t)$ of a linear time invariant continuous time system is described by $h(t) = \exp(\alpha t)u(t) + \exp(\beta t)u(t)$ and α and β are real constants. This system is stable for (a) α is positive and β is positive (b) α is negative and β is negative (c) α is positive and β is negative (d) α is negative and β is positive	
26.	n-type silicon is obtained by doping silicon with (a) Germanium (b) Aluminium (c) Boron (d) Phosphorus	
27.	The band gap of silicon at room temperature is (a) 1.3 eV (b) 0.7 eV (c) 1.1 eV (d) 1.4 eV	
28.	Under low level injection assumption, the injected minority carrier current through for an extrinsic semiconductor is essentially the (a) Diffusion current (b) Drift current (c) Recombination current (d) Induced current	
29.	Drift current in semiconductors depends upon (a) only the electric field (b) only the carrier concentration current (c) Both the electric field and carrier concentration (d) Neither the electric field nor the carrier concentration	
30.	Under high electric fields, in a semiconductor with increasing electric field, (a) The mobility of charge carriers decreases (b) The mobility of charge carriers increases (c) The velocity of charge carriers saturates (d) The velocity of charge carriers increases	
31.	The diffusion potential across a P-N junction (a) decreases with increasing doping concentration (b) increases with decreasing band gap (c) does not depend on doping concentrations (d) increases with increase in doping concentration	
32.	Schottky diode turns off (a) faster w.r.t PN diode (b) slower w.r.t PN diode (c) same speed (d) none of the above	
33.	Which of the following exhibits devices exhibits negative resistance characteristics (a) Photo diode (b) Zener diode (c) Tunnel diode (d) MOSFET	
34.	A tunnel diode is best suited for (a) Very low frequencies (b) Very low frequencies (c) Microwave frequencies (d) none of the above	
35.	Which of the following devices has the highest input resistance (a) diode (b) JFET (c) MOSFET (d) BJT	

36.	A zener diode works on the principle of (a) tunnelling of charge carriers across the junction (b) thermo ionic emission (c) diffusion of charge across the junction (d) accumulation of charge carriers across the junction	
37.	For small signal ac operation, a practical forward biased diode can be modelled as (a) a resistance and a capacitance (b) an ideal diode and resistance in parallel (c) a resistance and a ideal diode in series (d) a resistance	
38.	The static characteristic of an adequately forward biased p-n junction is a straight line, if the plot is (a) $\log I$ vs $\log V$ (b) $\log I$ vs V (c) I vs $\log V$ (d) I vs V	
39.	A zener diode, when used in voltage stabilization circuits, is biased in (a) Reverse bias region below the breakdown region (b) Reverse breakdown region (c) Forward bias region (d) Forward bias constant current mode	
40.	The Ebers-Moll model is applicable to (a) Bipolar junction transistors (b) NMOS transistors (c) Unipolar junction transistors (d) Junction field effect transistors	
41.	A FET operates on (a) majority carriers only (b) minority carriers only (c) positively charged ions only (d) none of the above	
42.	Thermal runaway is not possible in FET because as the temperature of FET increases (a) the transconductance increases (b) the drain current increases (c) the mobility of the carriers decreases (d) none of the above	
43.	Which of the following devices is used at the first stage of an electronic voltmeter (a) BJT (b) SCR (c) MOSFET (d) UJT	
44.	MOSFET can be used as a (a) Current controlled capacitor (b) Voltage controlled capacitor (c) Current controlled inductor (d) Voltage controlled inductor	
45.	In a MOSFET, the polarity of the inversion layer is the same as that of the (a) charge on the electrode (b) minority carries in the drain (c) majority carries in the substrate (d) majority carries in the source	
46.	The DC current gain (β) of a BJT is 50. Assessing that, the emitter junction efficiency is 0.995, the base transport factor (a) 0.980 (b) 0.985 (c) 0.990 (d) 0.995	
47.	A MOS capacitor made using p-type substrate is in the accumulation mode. The dominant charge in the channel is due to the presence of (a) Holes (b) Electrons (c) Positively charged ions (d) negatively charged ions	

48.	A DC power supply has a No-load voltage of 30V and a full-load voltage of 25V at a full-load current of 1A. The output resistance and load regulation respectively are (a) 5 Ω and 20% (b) 25 Ω and 20% (c) 5 Ω and 16.7% (d) 25 Ω and 16.7%	
49.	A BJT is said to be operating in the saturation region if (a) Both the Junctions are reverse biased (b) Base-Emitter junction is reverse biased and Base-collector junction is forward biased (c) Base-Emitter junction is forward biased and Base-collector junction is reverse biased (d) Both the junctions are forward biased	
50.	In a bipolar transistor at room temperature, if the emitter current is doubled the voltage across its base-emitter junction (a) doubles (b) halves (c) increase by about 20 mV (d) decrease by about 20 mV	
51.	The current gain of a BJT is (a) $g_m r_o$ (b) g_m / r_o (c) $g_m r_\pi$ (d) g_m / r_π	
52.	A cascade Amplifier stage is equivalent to (a) A common emitter stage followed by a common base stage (b) A common base stage followed by an Emitter follower (c) An Emitter follower stage followed by a common base stage (d) A common base stage followed by a common Emitter stage	
53.	The cascade amplifier is a configuration of (a) CC-CB (b) CE-CB (c) CB-CC (d) CE-CC	
54.	If the emitter resistance in a common-emitter voltage amplifier is not bypassed, it will (a) reduce both the voltage gain and the input impedance (b) reduce the voltage gain and increase the input impedance (c) increase the voltage gain and reduce the input impedance (d) increase both the voltage gain and the input impedance	
55.	In a multistage EC-Coupled amplifier the coupling capacitor (a) limits the low frequency response (b) limits the high frequency response (c) does not effect the frequency response (d) blocks the d.c components without effecting the frequency response	
56.	The current of a bipolar transistor drops at high frequencies because of (a) Transistor capacitances (b) High current effects in the base (c) Parasitic inductive elements (d) The Early effect	
57.	Generally, the gain of a transistor amplifier falls at high frequency due to (a) Internal capacitances of the device (b) Coupling capacitor at the input (c) Skin effect (d) Coupling capacitor at the output	

58.	An n-channel depletion MOSFET has the following two points on its $I_D - V_{GS}$ curve: (i) $V_{GS} = 0$ at $I_D = 12 \text{ mA}$ and (ii) $V_{GS} = -6$ at $Z_0 = \infty$	
	(a) $V_{GS} = -6 \text{ Volts}$ (c) $V_{GS} = 0 \text{ Volts}$	(b) $V_{GS} = -3 \text{ Volts}$ (d) 3 Volts
59.	A change in the value of the Emitter resistance (R_e) in a difference amplifier (a) affects the difference mode gain A_d (c) affects both A_d and A_c	(b) affects the common mode gain A_c (d) does not affect either A_d or A_c
60.	In a differential amplifier CMRR can be improved by using an increased (a) Emitter resistance (c) Power supply voltage	(b) Collector resistance (d) Source resistance
61.	If the differential voltage gain and the common mode voltage gain of a differential amplifier are 48 dB and 2 dB respectively, then its common mode rejection ratio is (a) 23 dB (c) 46 dB	(b) 25 dB (d) 50 dB
62.	An ideal op-amp is a ideal (a) voltage controlled current source (b) voltage controlled voltage source (c) current controlled current source (d) current controlled voltage source	
63.	In case of class A amplifiers, the ratio (efficiency of transformer coupled amplifier)/(efficiency of a transformer less amplifier) is (a) 2.9 (c) 1.0	(b) 2 (d) 0.5
64.	The range of signed representation numbers that can be represented by 6-bit 1's complement number is (a) -31 to +31 (c) -64 to +64	(b) -63 to +63 (d) -32 to +31
65.	2's complement representation of a 16-bit number (one sign bit and 15 magnitude bits) is FFFF. Its magnitude in decimal representation is (a) 0 (c) 32,767	(b) 1 (d) 65,535
66.	An equivalent 2's complement representation of the 2's complement number 1101 is (a) 110100 (c) 110111	(b) 001101 (d) 111101
67.	4-bit 2's complement representation of a decimal number is 1000. The number is (a) +8 (c) -7	(b) 0 (d) -8
68.	Decimal 43 in Hexadecimal and BCD number system is respectively. (a) B2, 0100 0011 (c) 2B, 0011 0100	(b) 2B, 0100 0011 (d) B2, 0100 0100

69.	X = 01110 and y = 11001 are two 5-bit binary numbers represented in two's complement format. The sum of x and y represented in two's complement format using 6bits is (a) 100111 (b) 001000 (c) 000111 (d) 101001	
70.	11001, 1001 and 111001 correspond to the 2's complement representation of which one of the following sets of number? (a) 25, 9 and 57 respectively (b) -6, -6 and -6 respectively (c) -7, -7 and -7 respectively (d) -25, -9 and -57 respectively	
71.	For a n – variable Boolean function maximum number of prime implicants is (a) $2(n-1)$ (b) $n/2$ (c) 2^n (d) $2^{(n-1)}$	
72.	The Boolean function $Y = AB + CD$ is to be realized using only 2-input NAND gates. The minimum number of gates required is (a) 2 (b) 3 (c) 4 (d) 5	
73.	Indicate which of the following logic gates can be used to realize all possible combinational logic functions (a) OR gates only (b) NAND gates only (c) EX-OR gates only (d) None of the above	
74.	A bulb in a staircase has two switches, one switch being at the ground floor and the other one at the first floor. The bulb can be turned ON also be turned OFF by any one of the switches irrespective of the other switch. The logic of switching of the bulb resembles (a) an AND gate (b) an OR gate (c) an XOR gate (d) a NAND gate	
75.	What are the minimum number of 2-to-1 multiplexers required to generate a 2-input AND gate and a 2-input EX-OR gate? (a) 1 and 2 (b) 1 and 3 (c) 1 and 1 (c) 2 and 2	
76.	A 0 to 6 counter consists of 3 flip-flops and a combination circuit of 2 input gate(s). The combination circuit consists of (a) one AND gate (b) one OR gate (c) one AND gate and one OR gate (d) two AND gates	
77.	The number of comparators in a 4-bit flash ADC is (a) 4 (b) 5 (c) 15 (d) 16	
78.	A PLL can be used to demodulate (a) Pam signals (b) PCM signals (c) FM signals (d) DC+SB-SC signals	
79.	The image channel selectivity of super heterodyne receiver depends upon (a) IF amplifiers only (b) RF and IF amplifiers only (c) Pre selector, RF and IF amplifiers (d) Pre selector and RF amplifiers only	

80.	An AM signal and a narrow band FM signal with identical carriers, modulating signals and modulation indices of 0.1 are added together. The resultant signal can be closely approximated by (a) Broadband Fm (b) SSB with carrier (c) DSB-SC (d) SSB without carrier	
81.	In a radar receiver the antenna is connected to the receiver through a waveguide. Placing the preamplifier on the antenna side of the waveguide rather than on the receiver side leads to: (a) A reduction in the overall noise figure (b) A reduction in interference (c) An improvement in selectivity characteristics (d) An improvement in directional characteristics	
82.	The maximum power efficiency of an AM modulator is (a) 25 % (b) 50 % (c) 75 % (d) 100 %	
83.	An FM signal with a modulation index 9 is applied to a frequency tripler. The modulation index in the output signal will be (a) 0 (b) 3 (c) 9 (d) 27	
84.	Two sinusoidal signals of same amplitude and frequencies 10 kHz and 10.1 kHz are added together. The combined signal is given to an ideal frequency detector. The output of the detector is (a) 0.1 kHz sinusoid (b) 20.1 kHz sinusoid (c) a linear function of time (d) a constant	
85.	If the number of bits per sample in a PCM system is increased from n to $n + 1$, the improvement in signal to quantization noise will be (a) 3 dB (b) 6 dB (c) $2n$ dB (d) n dB	
86.	In a PCM system with uniform quantization, increasing the number of bits from 8 to 9 will reduce the quantization noise power by a factor of (a) 9 (b) 8 (c) 4 (d) 2	
87.	In a binary data transmission DPSK is preferred over PSK because (a) a coherent carrier is required to be generated at the receiver (b) for a given energy per bit, the probability of error is less (c) the 180° phase shifts of the carrier are unimportant (d) more protection is provide against impulse noise	
88.	Coherent demodulation of FSK signal can be effected using (a) correlation receiver (b) band pass filters and envelope detectors (c) matched filters (d) discrimination detection	
89.	The number of hardware interrupts (which require an external signal to interrupt) present in an 8085 microprocessor are (a) 2 (b) 4 (c) 5 (d) 8	
90.	In the 8085 microprocessor, the RST6 instruction transfers the program execution to the following location (a) 30 H (b) 24 H (c) 48 H (d) 60H	

91.	In an 8085 microprocessor, the contents of the accumulator and the carry flag are A7 (in hex) and 0, respectively. If the instruction RLC is executed, then the contents of the accumulator (in hex) and the carry flag, respectively, will be	
	(a) 4E and 0 (c) 4F and 0	(b) 4E and 1 (d) 4F and 1
92.	An I/O processor control the flow of information between (a) cache memory and I/O devices (b) main memory and I/O devices (c) two I/O devices (d) cache and main memory	
93.	A microprocessor with a 16-bit address bus is used in a linear memory selection configuration (i.e. address bus lines are directly used as chip selects of memory chips) with 4 memory chips. The maximum addressable memory space is (a) 4 K (c) 64 K	(b) 16 K (d) 8 K
94.	In an 8085 microprocessor system, the RST instruction will cause an interrupt (a) only if an interrupt service routine is not being executed (b) only if a bit in the interrupt mask is made 0 (c) only if interrupts have been enabled by an EI instruction (d) none of the above	
95.	In an 8085 microprocessor system with memory mapped I/O, (a) I/O devices have 8 bit address (b) I/O devices are accessed using IN and OUT instructions (c) there can be a maximum of 256 input devices and output devices (d) arithmetic and logic operations can be directly performed with the I/O data	
96.	Air friction damping is used in the instrument which is (a) moving iron (c) induction	(b) moving coil (d) hot wire
97.	Which of the following is absolute instrument? (a) power factor meter (c) wattmeter	(b) Ammeter (d) tangent galvanometer
98.	Which of the following types of instrument is an integrating instrument? (a) power factor meter (c) wattmeter	(b) energy meter (d) frequency meter
99.	The controlling torque in a spring controlled meter is proportional to (a) θ (c) $1/\theta$	(b) θ^2 (d) $1/\theta^2$
100.	The internal resistance of the multi-ammeter must be very low for (a) high sensitivity (b) high accuracy (c) maximum voltage drop across the meter (d) minimum effect on the current in the circuit	
