NATIONAL INSTITUTE OF TECHNICAL TEACHERS TRAINING AND RESEARCH
(DEEMED TO BE UNIVERSITY UNDER DISTINCT CATEGORY)
CHANDIGARH

Ph.D. Entrance Examination - January 2025

Subject / Branch / Department	:	**ELECTRONICS & COMMUNICATION ENGINEERING**
Roll No.	:	
Candidate Name	:	
Date of Examination	:	

Maximum Marks: 25 (There is no negative marking)

Notes: (a) Only one option to be tick-marked out of the four options given as answer

(b) The Candidate must put his/her signature with date at the bottom of each page

(c) For any rough work, please use ONLY back-sides of pages which are left blank

Q1.	In a long-channel MOSFET, the sub-threshold current dependsexponentialy on which of the following parameters
(a)	Gate-source voltage and temperature
(b)	Gate oxide thickness
(c)	Channel length modulation parameter
(d)	Doping concentration of the channel
Q2.	For an n-channel MOSFET operating in the saturation region, the draincurrent (I_D) varies with the applied drain-source voltage (V_DS) due to:
(a)	Channel length modulation
(b)	Body effect
(c)	Surface mobility degradation
(d)	Threshold voltage roll-off
Q3.	In a pn junction diode, the depletion capacitance in reverse bias isinversely proportional to:
(a)	Doping levels of the pn junction
(b)	Reverse voltage raised to the power of 3/2
(c)	Square root of the applied reverse voltage
(d)	Built-in potential
Q4.	The Early effect in a BJT refers to:
(a)	Reduction of base width due to high-level injection

(b)	Increase in collector current with collector voltage
(c)	Base widening due to reverse bias
(d)	Increase in base recombination at high currents

Q5. A 4-bit ripple counter with flip-flops having a propagation delay of 20 ns, each will have a maximum clock frequency of:

(a)	12.5 MHz
(b)	25 MHz
(c)	50 MHz
(d)	62.5 MHz

Q6. A Moore machine differs from a Mealy machine in that:

(a)	Moore machine's output depends only on the current state
(b)	Moore machine's output depends on both current state and input
(c)	Moore machine's has more states than Mealy machine
(d)	Moore machine's states depend on the previous input

Q7. In a synchronous sequential circuit, setup time is defined as:

(a)	Minimum time the data input must be stable before the clock edge
(b)	Minimum time the data input must be stable after the clock edge
(c)	Time taken by a flip-flop to produce output after the clock pulse
(d)	Time required for the clock signal to propagate through the circuit

Q8. The fan-out of a CMOS gate is primarily determined by:

(a)	Input capacitance of the gate
(b)	Propagation delay of the gate
(c)	Power dissipation of the gate
(d)	Voltage swing of the gate

Q9. The main function of the mixer in a superheterodyne receiver is to

(a)	Amplify the input signal
(b)	Reject noise
(c)	Demodulate the signal
(d)	Convert the RF signal to IF

Q10. Matched filter receivers are optimal because they

(a)	Minimize noise
(b)	Maximize signal-to-noise ratio
(c)	Reduce bandwidth
(d)	Prevent inter-symbol interference

Q11.	In a full-wave rectifier, the ripple frequency for a 50 Hz input is:
(a)	25 Hz
(b)	100 Hz
(c)	50 Hz
(d)	200 Hz

Q12.	In a BJT, if the base-emitter junction is reverse-biased, the transistor is in
(a)	Active mode
(b)	Saturation mode
(c)	Cut-off mode
(d)	Inverted mode

Q13.	The common-mode rejection ratio (CMRR) of a differential amplifier is
(a)	Ratio of differential voltage gain to common-mode gain
(b)	Ratio of common-mode gain to differential voltage gain
(c)	Always equal to 1
(d)	Ratio of input to output impedance

Q14.	A Wien Bridge oscillator uses which components to determine the frequency of oscillation?
(a)	Resistors only
(b)	Capacitors only
(c)	Resistors and capacitors
(d)	Inductors and capacitors

Q15.	The phase velocity (v_p) of a plane wave in a medium is given by
(a)	$v_p = \sqrt{\mu\varepsilon}$
(b)	$v_p = 1/\sqrt{\mu\varepsilon}$
(c)	$v_p = \mu\varepsilon$
(d)	$v_p = \sqrt{\mu/\varepsilon}$

Q16.	The capacity C of a noisy channel with bandwidth B Hz and signal-to-noise ratio S/N is given by
(a)	$C = B \log_2 (1+S/N)$
(b)	$C = (S/N) \cdot B$
(c)	$C = \log_2(B+S/N)$
(d)	$C = \log_2 (1+S/N)$

Q17.	Negative feedback in a closed-loop control system DOES NOT

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(a)	reduce the overall gain
(b)	reduce bandwidth
(c)	improve disturbance rejection
(d)	reduce sensitivity to parameter variation

Q18. The transfer function of a system is defined as

(a)	Laplace transform of the step response
(b)	Laplace transform of the sinusoidal input
(c)	Laplace transform of the ramp response
(d)	Laplace transform of the output variable to Laplace transform of the input variable assuming all initial conditions to be zero

Q19. The transient response, with feedback system

(a)	rises slowly
(b)	rises quickly
(c)	decays slowly
(d)	decays quickly

Q20. The type 0 system has _____ at the origin.

(a)	no pole
(b)	net pole
(c)	simple pole
(d)	two poles

Q21. A network contains linear resistors and ideal voltage sources. If values of all the resistors are doubled, then the voltage across each resistor is

(a)	halved
(b)	doubled
(c)	increased by four times
(d)	not changed

Q22. Three resistors of 6 Ohms (each) are connected in parallel. What will be the equivalent resistance ?

(a)	9 Ohms
(b)	6 Ohms
(c)	18 Ohms
(d)	2 Ohms

Q23. Siemens is the S.I unit of _____

| (a) | Resistance |

(b)	Conductance
(c)	Capacitance
(d)	Inductance
Q24.	Norton's theorem states 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 current source
(c)	in series with a voltage source
(d)	in parallel with a voltage source
Q25.	If a network comprises purely of resistive elements, what will it provide from the following?
(a)	attenuation
(b)	phase shift
(c)	both a and b
(d)	amplification

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ANSWER-KEY

Subject / Branch / Department	:	ECE
Date of Examination	:	25/01/2025

Question No.	Correct Answer
Q1	a
Q2	a
Q3	c
Q4	b
Q5	a
Q6	a
Q7	a
Q8	a
Q9	d
Q10	b
Q11	b
Q12	c
Q13	a
Q14	c
Q15	a
Q16	a
Q17	b
Q18	d
Q19	d
Q20	a

Q21	d
Q22	d
Q23	b
Q24	b
Q25	a

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