

Code No.

R – 2128

**Entrance Examination for Admission to the M.Tech. Courses in the
Teaching Departments, 2023**

CSS

**ELECTRONICS AND COMMUNICATION (OPTO ELECTRONICS AND
OPTICAL COMMUNICATION)**

General Instructions

1. The Question Paper is having 100 Objective Questions, each carrying one mark.
2. The answers are to be (✓) 'tick marked' **only** in the "**Response Sheet**" provided.
3. **Negative marking : 0.25 marks** will be deducted for each wrong answer .

Time : 2 Hours

Max. Marks : 100

To be filled in by the Candidate									
Register Number	in Figures								
	in words								

Choose appropriate answer from the options in the questions.

(100 × 1 = 100 marks)

1. Norton's theorem states that a complex network connected to a load can be replaced with 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

DO NOT WRITE HERE

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2. A Zener diode works on the principle of
- a) tunneling of charge carriers across the junction
 - b) thermionic emission
 - c) diffusion of charge carriers across the junction
 - d) hopping of charge carriers across the junction

3. LASER emission from ruby crystal is because of transition
 - a) from the conduction band to the valance band of Al_2O_3
 - b) from the conduction band to one of the levels due to Cr ions.
 - c) between energy levels introduced by Cr ions
 - d) between one of the levels due to Cr ion and valance band Al_2O_3

4. A single instruction to clear the lower four bits of the accumulator in 8085 assembly language is

a) XRI OFH	b) ANI FOH
c) XRI FOH	d) ANI OFH

5. A resistor used in colour television has the following colour bands yellow, violet, orange and silver. Its normal value is

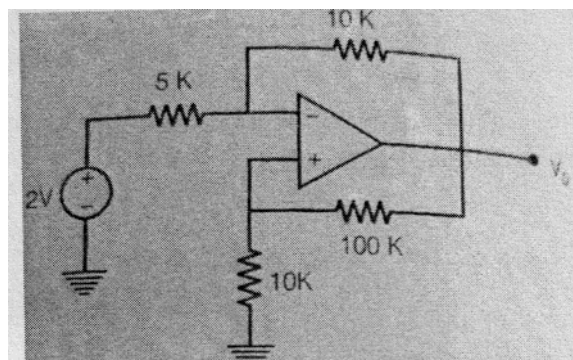
a) $4.7 \text{ k}\Omega \pm 10\%$	b) $47 \text{ k}\Omega \pm 5\%$
c) $47 \text{ k}\Omega \pm 10\%$	d) none of these

6. The ratio of the amplitude of the magnetic field to the amplitude of the electric field for electromagnetic wave propagation in a vacuum is equal to
 - a) unity
 - b) speed of light in vacuum
 - c) reciprocal of the speed of light in vacuum
 - d) the ratio of magnetic permeability to electrical susceptibility in a vacuum

7. The contents of Register B and accumulator A of 8085 microprocessor are 49 H and 3A H respectively. The contents of A and the status of carry flag (CY) and sign flag (S) after executing SUB B instructions are
 - a) $A = \text{F1}, \text{CY} = 1, \text{S} = 1$
 - b) $A = \text{0F}, \text{CY} = 1, \text{S} = 1$
 - c) $A = \text{F0}, \text{CY} = 0, \text{S} = 0$
 - d) $A = \text{1F}, \text{CY} = 1, \text{S} = 1$

8. A transistor connected in common-base configuration has _____
- a high input resistance and a low output resistance
 - a low input resistance and high output resistance
 - a low input resistance and a low output resistance
 - a high input resistance and a high output resistance
9. The inverse Laplace transform of the function $\frac{s+5}{(s+1)(s+3)}$ is _____
- $2e^{-t} - e^{-3t}$
 - $2e^{-t} + e^{-3t}$
 - $e^{-t} - 2e^{-3t}$
 - $e^{-t} + 2e^{-3t}$
10. Poisson's equation for an inhomogeneous medium is _____
- $\nabla^2 V = -\rho$
 - $\nabla \cdot (\nabla V) = -\rho$
 - $\nabla^2(V) = -\rho$
 - $\nabla(\nabla V) = -\rho$
11. The pinch-off voltage of a JFET is 5.0 volts. Its cut-off voltage is
- $(5.0)^{1/2} \text{ V}$
 - 2.5 V
 - 5.0 V
 - $(5.0)^{3/2} \text{ V}$
12. A second-order band-pass active filter can be obtained by cascading a low pass second order section having cut off frequency f_{OH} with a high pass second order section having cut-off frequency f_{OL} provided
- $f_{OH} > f_{OL}$
 - $f_{OH} < f_{OL}$
 - $f_{OH} = f_{OL}$
 - $f_{OH} < 2f_{OL}$
13. Devices fabricated from GaAs or AlGaAs operate in wavelength region of _____
- 0.1 and 0.2 μm
 - 0.8 and 0.9 μm
 - 0.4 and 0.6 μm
 - 0.6 and 0.7 μm

14. The output voltage V_o of the circuit shown in the figure is _____



- a) -4V b) 6V
c) 5V d) -5.5V
15. Which of the following statements does not pertain to the equation $\nabla \cdot \mathbf{B} = 0$?
- a) there are no sinks and sources for magnetic fields
 - b) magnetic field is perpendicular to the electric field
 - c) single magnetic pole cannot exist
 - d) \mathbf{B} is solenoidal
16. Class AB operation is often used in power (large signal) amplifiers in order to _____
- a) get maximum efficiency
 - b) remove even harmonics
 - c) overcome a cross-over distortion
 - d) reduce collector dissipation
17. For a D/A converter, the resolution required is 50 mV and the total maximum input is 10V. The number of bits required is _____
- a) 7 b) 8
c) 9 d) 10

18. In a graded index fiber, the total reflected light takes a _____
- a) straight line path
 - b) parabolic path
 - c) elliptical path
 - d) circular path
19. For a BJT, under the saturation condition _____
- a) $I_C = \beta I_B$
 - b) $I_C > \beta I_B$
 - c) I_C is independent of all other parameters
 - d) $I_C < \beta I_B$
20. In a half adder having two inputs {A and B} and two outputs {sum (s) and carry (C_{out})}, the Boolean expression for S and C_{out} in terms of A and B are _____
- a) $S = A'B + AB'$ and $C = A.B$
 - b) $S = AB + A'B$ and $C = A+B$
 - c) $S = A'B' + AB$ and $C = A+B'$
 - d) $S = A'B + AB'$ and $C = A'B'$
21. The colour of an LED can be changed _____
- a) by changing the doping level
 - b) by increasing the applied voltage
 - c) by using different band gap semiconductors
 - d) by decreasing the applied voltage
22. The most commonly used amplifier in sample and hold circuit is _____
- a) a unity gain inverting amplifier
 - b) a unity gain non-inverting amplifier
 - c) an inverting amplifier with a gain of 10
 - d) an inverting amplifier with a gain of 100.

23. The time required to spin the desired sector under the read/write head, once the read/write head is positioned on the desired track is known as _____
- a) seek time
 - b) arrival rate
 - c) latency
 - d) transfer rate
24. A $1\ \mu\text{s}$ pulse can be converted into a 1 ms pulse by using _____
- a) a monostable multivibrator
 - b) an astable multivibrator
 - c) a bistable multivibrator
 - d) a J-K flip flop
25. Conductivity of n-type semiconductor _____
- a) Increases with increase in number of holes
 - b) decreases with increase in number of hole
 - c) decreases with increase in number of electrons
 - d) increases with increase in number of electrons
26. Which of the following relational operations in C means “not equal to”?
- a) $=$
 - b) $!=$
 - c) $>=$
 - d) $<=$
27. 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

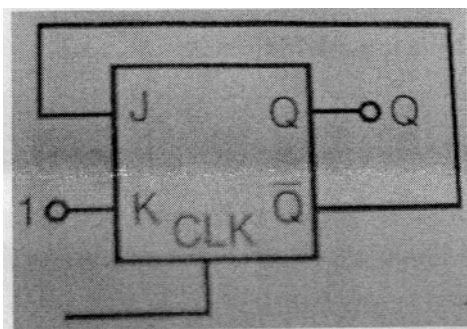
- $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ is _____

- a) $56 \mu\text{A}$ b) $140 \mu\text{A}$
c) $60 \mu\text{A}$ d) $3 \mu\text{A}$

33. Which order of polynomials can best be integrated using Trapezoidal rules?
 - a) 4th order
 - b) 3rd order
 - c) 2nd order
 - d) 1st order
34. Out of the following, which one is not valid as an if-else statement in C programming?
 - a) if ((char) x) { }
 - b) if (x) { }
 - c) if (func 1 (x)) { }
 - d) if (if(x == 1)) { }
35. If $v = 2xy$, then analytic function $f(z) = u + iv$ is _____
 - a) $z^2 + c$
 - b) $z^{-2} + c$
 - c) $z^3 + c$
 - d) $z^{-3} + c$
36. The group of bits 10110111 is serially shifted (right-most bit first) into an 8-bit parallel output shift register with an initial state 11110000. After two clock pulses, the register contains _____
 - a) 10111000
 - b) 10110111
 - c) 11110000
 - d) 11111100
37. The common register(s) for all the four channels of 8257 is _____
 - a) DMA address register
 - b) terminal count register
 - c) mode set register and status register
 - d) none of the mentioned
38. The output of a logic gate is '1' when all its inputs are at logic '0'. The gate is either _____
 - a) a NAND or and EX-OR gate
 - b) a NOR or an EX-NOR gate
 - c) an OR or an EX-NOR gate
 - d) an AND or an EX-OR gate

39. To a Schmitt trigger in non-inverting configuration an input triangular wave of $1V_p$ is applied. What will be the output waveform, if the upper and lower threshold voltages are $0.25V$?
- a) square waveform
 - b) pulse waveform
 - c) sawtooth waveform
 - d) cannot be determined
40. Rolle's Theorem tells about the _____
- a) existence of point c where derivative of a function become zero
 - b) existence of point c where derivative of a function is positive
 - c) existence of point c where derivative of a function is negative
 - d) existence of point c where derivative of a function is either positive or negative
41. The refractive indices of core and cladding of an optical fiber are 1.40 and 1.14 respectively. What is the value of numerical aperture?
- a) 0.312
 - b) 0.812
 - c) 0.646
 - d) 0.552
42. The eigenvalues of a skew-symmetric matrix are _____
- a) always zero
 - b) always pure imaginary
 - c) either zero or pure imaginary
 - d) always real
43. A basic multiplexer principle can be demonstrated through the use of a _____
- a) Single-pole relay
 - b) DPDT switch
 - c) rotary switch
 - d) linear stepper
44. The time period (T) of a monostable 555 timer is _____
- a) $T = 0.33RC$
 - b) $T = 1.1RC$
 - c) $T = 3RC$
 - d) $T = RC$

45. The complement of the Boolean expression $AB.(B'C + AC)$ is _____
- a) $(A' + B') + (B + C')(A' + C')$ b) $(A'.B') + (BC' + A'C')$
c) $(A' + B') . (B+C')(A' + C')$ d) $(A+B).(B'+C)(A+C)$
46. In a phase locked loop, lock occurs when the _____
- a) input frequency and the VCO frequency are the same
b) phase error is 180°
c) VCO frequency is double the input frequency
d) phase error is 90°
47. What is the relationship between B_{21} and B_{12} ?
- a) $B_{12} > B_{21}$ b) $B_{12} < B_{21}$
c) $B_{12} = B_{21}$ d) No specific relation
48. Total internal reflection can take place when light travels from _____
- a) air to glass b) water to glass
c) air to water d) diamond to glass
49. In a JK flip-flop we have $J = Q'$ and $K = 1$, as shown in the below figure. Assuming that the flip-flop was initially cleared and then clocked for 6 pulses, the sequence at the output will be _____



- a) 010000 b) 011001
c) 010010 d) 010101

50. To obtain very high input and output impedance in a feedback amplifier, the topology mostly used is _____
- a) voltage-series
 - b) current-series
 - c) voltage-shunt
 - d) current-shunt
51. Two electrons moving parallel to each other with the same velocity will _____
- a) attract each other if they move in the same direction
 - b) repel each other more strongly when moving in same direction than when moving in opposite direction
 - c) repel each other with the same force when moving in the same or opposite direction
 - d) repel each other less strongly when moving in same direction than when moving in opposite direction
52. What should be the band gap of the semiconductors to be used as solar cell materials?
- a) 0.5 eV
 - b) 1 eV
 - c) 1.5 eV
 - d) 1.9 eV
53. The scattering of waves in Bragg's law experiment is due to _____
- a) Einstein's scattering
 - b) Rayleigh scattering
 - c) Newton scattering
 - d) Inelastic scattering
54. An ideal op-amp has _____
- a) infinite input and output impedance
 - b) very low input and output impedance
 - c) low input and infinite output impedance
 - d) infinite input and zero output impedance

55. A shift register in which the output of the last flip-flop is connected to the input of first flip-flop is called a _____
- a) BCD counter
 - b) parallel counter
 - c) ripple counter
 - d) ring counter
56. Material dispersion of an optical fiber vanishes if _____
- a) refractive index of the core varies linearly with wavelength
 - b) refractive index of both core and cladding varies linearly with wavelength
 - c) refractive index of the core remains constant with wavelength
 - d) both (a) and (c)
57. 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
58. Which among the following is true?
- a) According to Kirchhoff's law, the current flowing towards a junction is equal to the voltage drop
 - b) According to Kirchhoff's law, the current flowing towards a junction is equal to the resistance across the junction
 - c) According to Kirchhoff's law, the current flowing towards a junction is equal to the current leaving the junction
 - d) According to Kirchhoff's law, the current flowing towards a junction is equal to all the currents in the circuit
59. Minimum number of flip flop required for Modulus 15 counter is _____
- a) 15
 - b) 16
 - c) 4
 - d) 3

60. After triggering an SCR, the gate pulse is removed. The current in the SCR will _____
- a) immediately fall to zero
 - b) rise up
 - c) remain the same
 - d) immediately rise a little and then falls to zero
61. For a photoconductor with equal electron and hole mobilities and perfect ohmic contacts at the ends, an increase in the intensity of optical illumination results in _____
- a) a change in open circuit voltage
 - b) a change in short-circuit current
 - c) a reduction of resistance
 - d) an increase in resistance
62. Which of the following addressing method does the instruction, MOV AX, [BX] represent?
- a) register indirect addressing mode
 - b) direct addressing mode
 - c) register addressing mode
 - d) register relative addressing mode
63. In a transistor Hartley oscillator _____
- a) Inductive feedback is used
 - b) untapped coil is used
 - c) entire coil is in the output circuit
 - d) no capacitor is used
64. The inductance of a low Q coil can be measured by _____
- a) Maxwell bridge
 - b) Owen bridge
 - c) Wein bridge
 - d) Schering bridge
65. In a N-type semiconductor, the position of Fermi-level _____
- a) is lower than the centre of energy gap
 - b) is at the centre of the energy gap
 - c) is higher than the centre of energy gap
 - d) can be any where

66. Attenuation in optical fiber can be measured in _____
a) KdB/m
b) dB/m
c) dB/km
d) dBm/m
67. If the wavelength of electromagnetic radiation is doubled, what will happen to the energy of photons?
a) Remains the same
b) Doubled
c) Halved
d) Infinite
68. The 2's complement of 11001000 is _____
a) 00110111
b) 00110001
c) 01001000
d) 00111000
69. A signal $x(t) = 2\cos(\pi \cdot 10^4 t)$ volts is applied to an FM modulator with the sensitivity constant of 10 KHz/volt. Then the modulation index of the FM wave is _____
a) 4
b) 2
c) $4/\pi$
d) $2/\pi$
70. For the matrix $\begin{bmatrix} -4 & 2 \\ 4 & 3 \end{bmatrix}$, the corresponding eigen vector is _____
a) $\begin{bmatrix} 3 \\ 2 \end{bmatrix}$
b) $\begin{bmatrix} 4 \\ 3 \end{bmatrix}$
c) $\begin{bmatrix} 2 \\ -1 \end{bmatrix}$
d) $\begin{bmatrix} -1 \\ 2 \end{bmatrix}$
71. Which among the following is true about Faraday's law of Induction?
a) An emf is induced in a conductor when it cuts the magnetic flux
b) An emf is induced in a conductor when it moves parallel to the magnetic field
c) An emf is induced in a conductor when it moves perpendicular to the magnetic field
d) An emf is induced in a conductor when it is just entering a magnetic field

72. In a LC filter, the ripple factor _____
- Increase with the load current
 - Increase with the load resistance
 - remains constant with the load current
 - has the lowest value
73. If $A = \text{diag } [3, -5, 7]$ and $B = \text{diag } [-1, 2, 4]$ then find the value of $2A + 3B$?
- $\text{diag } [3, -4, 26]$
 - $\text{diag } [-3, 4, 26]$
 - $\text{diag } [3, 4, -26]$
 - $\text{diag } [3, 4, 26]$
74. The V-parameter for an optical fiber is 50. The number of modes in that fiber is approximately _____
- 50
 - 100
 - 1250
 - 2500
75. The Boolean expression $(A' + B)(A + B)$ when simplified yields to _____
- A
 - B
 - A'
 - B'
76. Which of the following Bravais lattices exist as face centered unit cell?
- Orthorhombic
 - Monoclinic
 - Tetragonal
 - None of the mentioned
77. A coil has a resistance of 4 ohms and an inductance of 2H. It is connected to a 20V dc supply. Calculate the final value of the current in the circuit.
- 5A
 - 10A
 - 15A
 - 20A
78. The ripple factor of a bridge rectifier is _____
- 0.406
 - 0.812
 - 1.21
 - 1.11

79. A 2.5 m long straight wire having mass of 500g is suspended in mid-air by a uniform horizontal magnetic field B. If a current of 4 A is passing through the wire, then the magnitude of the field is [consider $g = 10\text{ms}^{-1}$]
 - a) 0.5T
 - b) 0.6T
 - c) 0.25T
 - d) 0.8T
80. When circuit has high input impedance, current drawn from it is _____
 - a) very large
 - b) very small
 - c) ∞
 - d) $-\infty$
81. The directivity of a T-coupler is defined as the power ratio between one port and another, which is _____ for ideal directivity.
 - a) one
 - b) zero
 - c) constant
 - d) infinity
82. Hall effect is observed in a specimen when it (metal or semiconductor) is carrying current and is placed in a magnetic field. The resultant electric field inside the specimen will be in _____
 - a) a direction normal to both current and magnetic field
 - b) the direction of current
 - c) a direction antiparallel to the magnetic field
 - d) an arbitrary direction depending upon the conductivity of the specimen
83. A 4 – bit modulo-16 ripple counter uses J K flip flops. If the propagation delay of each flip flop is 50ns, the maximum clock frequency that can be used is equal to _____
 - a) 20 MHz
 - b) 10 MHz
 - c) 5 MHz
 - d) 4 MHz
84. According to free electron theory _____
 - a) valance electrons are tightly bound with the atom
 - b) valance electrons are weakly bound with the atom
 - c) there is no free electron in metal
 - d) some valance electrons are tightly bound and some electrons are weakly bound

91. Holography is based on the principle of _____
- a) diffraction
 - b) interference
 - c) interferometer
 - d) polarization
92. Pre-emphasis in FM system involves _____
- a) compression of the modulating signal
 - b) expansion of the modulating signal
 - c) amplification of lower frequency components of the modulating signal
 - d) amplification of higher frequency components of the modulating signal
93. According to the poynting theorem, the energy flow per unit time out of any closed surface is _____
- a) integral of S over the length of the surface
 - b) integral of S over the area of the surface
 - c) differential of S over the length of the surface
 - d) differential of S over the area of the surface
94. Calculate the energy of a photon of wavelength 6600 angstroms.
- a) $3 \times 10^{-19} \text{ J}$
 - b) $30 \times 10^{-19} \text{ J}$
 - c) $300 \times 10^{-19} \text{ J}$
 - d) $3000 \times 10^{-19} \text{ J}$
95. Each cell of a static Random Access Memory contains _____
- a) 6 MOS transistor
 - b) 4 MOS transistor and 2 capacitors
 - c) 2 MOS transistor and 4 capacitors
 - d) 1 MOS transistor and 1 capacitors

96. The contents of accumulator in 8085 microprocessor are altered after the execution of the instruction _____
- a) CMP C
 - b) CPI 3A
 - c) ANI SC
 - d) ORA A
97. Among the following, which optical amplifier cannot be used for wideband amplification _____
- a) Erbium-doped fiber amplifier
 - b) Raman fiber amplifier
 - c) Brillouin fiber amplifier
 - d) Semiconductor optical amplifier
98. The effective channel length of a MOSFET in saturation decreases with increase in _____
- a) gate voltage
 - b) drain voltage
 - c) source voltage
 - d) body voltage
99. An example for material showing electro optic effect is _____
- a) germanium
 - b) carbon
 - c) lithium niobate
 - d) silicon
100. The trigonometric Fourier series of an even function does not have the _____
- a) dc term
 - b) cosine terms
 - c) sine terms
 - d) odd harmonic terms

ANSWER SHEET

1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5	A	B	C	D	E
6	A	B	C	D	E
7	A	B	C	D	E
8	A	B	C	D	E
9	A	B	C	D	E
10	A	B	C	D	E
11	A	B	C	D	E
12	A	B	C	D	E
13	A	B	C	D	E
14	A	B	C	D	E
15	A	B	C	D	E
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18	A	B	C	D	E
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25	A	B	C	D	E
26	A	B	C	D	E
27	A	B	C	D	E
28	A	B	C	D	E
29	A	B	C	D	E
30	A	B	C	D	E
31	A	B	C	D	E
32	A	B	C	D	E
33	A	B	C	D	E
34	A	B	C	D	E
35	A	B	C	D	E
36	A	B	C	D	E
37	A	B	C	D	E
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49	A	B	C	D	E
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91	A	B	C	D	E
92	A	B	C	D	E
93	A	B	C	D	E
94	A	B	C	D	E
95	A	B	C	D	E
96	A	B	C	D	E
97	A	B	C	D	E
98	A	B	C	D	E
99	A	B	C	D	E
100	A	B	C	D	E

ROUGH WORK

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