	Entrance Examination for Admission to the M.Tech. Courses in the Teaching Departments, 2021									
	CSS									
ELECTRONICS & COMMUNICATION (OPTOELECTRONICS AND OPTICAL COMMUNICATION)									ID	
	General Instructions									
1.	The Question Paper is having two Parts — Part 'A' Objective type (60%) & Part 'B' Descriptive type (40%).									
2.	Objective type questions which carry 1 mark each are to be (\checkmark) 'tick marked' in the response sheets against the appropriate answers provided.									
3.	8 questions are to be answered out of 12 questions carrying 5 marks each in Part 'B'.							Part 'B'.		
1.	Negative marking : 0.25 marks will be deducted for each wrong answer in Part 'A'.									
Гim	ime : 2 Hours Max. Marks : 100									
То	be fille	ed in by the Car	ndidate							
Re	gister	in Figures								
INUI	mber	in words								

PART – A

(Objective Type)

Choose appropriate answer from the options in the questions. **One** mark **each**.

(60 × 1 = 60 marks)

1. Permanent magnets are materials with

a)

- b) Low coercivity, Low retentivity
- c) High coercivity, High retentivity d)

High coercivity, Low retentivity

) Low coercivity, High retentivity

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2. Vibrational energy of molecules resonates with

a) Radio wave

- b) Micro wave
- c) IR wave d) UV wave
- 3. Unit of Q-factor is
 - a) Ohm
 - b) Ampere
 - c) Volt
 - d) None of these

- 4. The number of fundamental modes of vibration in water molecule is
 - a) 5 b) 3 c) 6 d) 2
- 5. The minimum number of energy levels required for lasing action is
 - a) 3 b) 2
 - c) 5 d) 1
- 6. Norton's equivalent circuit consists of
 - a) Current source and a series resistor
 - b) Voltage source and a parallel resistor
 - c) Current source and a parallel resistor
 - d) Voltage source and a series resistor
- 7. The electric flux passing out through each face of a cube enclosing a charge +q
 - a) q/ϵ_0
 - b) $q/2 \in_0$
 - c) $q/4 \in_0$
 - d) $q/6 \in_0$
- An optical fibre is placed in air, the refractive indices of the core and cladding are
 1.6 and 1.5 respectively. The numerical aperture is
 - a) 0.556 b) 56.77
 - c) 0.2458 d) 0.774

9. A transistor has $\alpha = 0.98$. Then the gain factor β is

- a) 0.49 b) 49
- c) 9.8 d) 98

10. The radius of earth reduces to half its original value, its angular velocity

- a) reduces to halfb) doublesc) increases 8 timesd) increases 4 times
- 11. Superconducting state is
 - a) Diamagnetic b) Paramagnetic
 - c) Ferromagnetic d) Super paramagnetic
- 12. The maximum wavelength that could be used for X-ray diffraction from a crystal of inter- planar spacing of 1 Å
 - a) 0.2 Å b) 1 Å c) 2 Å d) 4 Å
- 13. In Yong's double slit experiment the two slits have a width ratio of 1:4. Find the ratio of maximum to minimum intensity
 - a) 5:3 b) 4:1
 - c) 2:1 d) 9:1
- 14. What is the angle between the plane of the polariser and that of the analyser in order that intensity of transmitted light reduces to half
 - a) $\pi/4$ b) π
 - c) 2π d) $\pi/2$

- 15. The central spot in the Newton's ring is
 - a) bright b) rectangular
 - c) dark d) coloured
- 16. A long wire caries a steady current is bent into a circle of one turn and the magnetic field at the centre is B. It is then bent into coil of *n* turns. The magnetic field at the centre of the coil is
 - a) nB b) n^2B c) 2nB d) $2n^2B$

17. The ratio of electric field vector and magnetic field vector has the dimension of

- a) voltage b) resistance
- c) capacitance d) inductance
- 18. The power dissipation of a Silicon diode with I_d of 40mA is
 - a) 28W b) 28mW c) 280mW d) 2.8W
- 19. The coefficient of reflectivity of a perfect black body is
 - a) 0 b) 1 c) infinity d) 100
- 20. A gas does 4.2J of external work during adiabatic expansion if its temperature falls by 2K. Its internal energy
 - a) increase by 4.2J
 - b) decrease by 4.2J
 - c) remains constant
 - d) decrease by 2.2J

- 21. If λ is the wavelength of the first line of Balmer series in the Hydrogen spectrum, the wavelength of the first line of the Lyman series is
 - (32/27) λ b) (27/32) *λ* a)
 - c) (27/5) *λ* d) (5/27) λ
- 22. The half life of a radioactive substance is 6 hours. After 24 hours its activity will be $0.01\mu Ci$. Its initial activity is
 - a) 0.04*µCi* b) 0.08*µCi* 0.24*µCi* c) 0.16*µCi*
- 23. If a constraint depends on time explicitly, then it is
 - a) Scleronomic b) Rheonomic
 - c) Holonomic d) Non-holonomic
- 24. Lagrangean is having the dimension of
 - a) Time b) Force c) Velocity Energy d)
- 25. The eigen functions of a harmonic oscillator are
 - a) Legendre polynomial b) Hermite polynomial
 - c) **Bessel** function d) Spherical harmonics
- 26. The phase velocity (Vp) and group velocity (Vg) of the Debroglie wave in free space are related as
 - b) $VpVg = c^2$ a) Vp = Vq
 - d) $VpVg = 2c^2$ c) $VpVq = 0.5c^2$
- 27. The entropy of a system in irreversible process always
 - a) Increases b) Decreases
 - c) **Remains Constant** d) Zero

d)

- 28. Fullerene is made up of
 - a) Carbon atoms b) Germanium atoms
 - c) Silicon atoms d) Sodium atoms
- 29. Fibre optics communication uses the phenomenon of
 - a) tranmission
 - b) reflection
 - c) interference
 - d) total internal reflection
- 30. The digital logic family that exhibits lowest power consumption is
 - a) CMOS b) TTL
 - c) PMOS d) NMOS
- 31. The operation used in push-pull amplifier circuit is
 - a) Class A b) Class B
 - c) Class C d) Class AB
- 32. The point of intersection of d.c load line and a.c load line is
 - a) cut-off point
 - b) saturation point
 - c) operating point
 - d) ideal point
- 33. The ripple frequency of a full wave rectifier operated with a single phase supply frequency of 50Hz is
 - a) 25 Hz b) 50 Hz
 - c) 100 Hz d) 200 Hz

- 34. A voltage follower
 - a) has a gain of unity
 - b) has no feedback resistor
 - c) is non-inverting
 - d) all of the above
- 35. Three amplifier stages each with a voltage gain of 10 are cascaded. The net gain is
 - a) 10 b) 30
 - c) 300 d) 1000
- 36. The feedback used in Wien bridge oscillator is
 - a) Positive
 - b) Negative
 - c) Both positive and negative
 - d) No feedback
- 37. Sweep generator in CRO works on the principle of
 - a) Inductor b) Capacitor
 - c) Diode d) Resistor
- 38. The decimal equivalent of the octal number $(645)_8$ is
 - a) (450)₁₀ b) (421)₁₀
 - c) (451)₁₀ d) (501)₁₀

- 39. Comparators are used in
 - a) Memory b) CPU
 - c) Motherboard d) Hard-drive

40. A basic SR flip-flop can be constructed by Cross-coupling of

- a) AND or OR b) XOR or XNOR
- c) NOR or NAND d) None of the above

41. The value of A+1 in Boolean algebra is

- a) 1b) 0c) Ad) None of these
- 42. The TV transmission tower has a height of 200m. By how much the height of tower be Increased to triple its coverage range.

a)	1600 m	b)	1800 m
c)	800 m	d)	600 m

- 43. The 16 bit registers in 8085 microprocessor is/are
 - a) Stack pointer
 - b) Program counter
 - c) Both (a) and (b)
 - d) Accumulator
- 44. The NOP instruction in 8086 processor introduces
 - a) Address
 - b) Memory
 - c) Reset
 - d) Delay

- 45. The e.m.f. induced when a conductor of length 0.2m. moves in a magnetic field of 5T with a velocity of 0.3m/s
 - a) 0.3V b) 0.03V
 - c) 30V d) 3V
- 46. The unit of magnetic flux is
 - a) Weber b) Maxwell
 - c) Weber/m² d) Both (a) and (b)
- 47. A substance that changes its electrical resistance when illuminated by light is
 - a) Photovoltaic
 - b) Photoelectric
 - c) Photoconductive
 - d) None of these
- 48. A dipole antenna is an example of
 - a) Wire antenna
 - b) Aperture antenna
 - c) Array antenna
 - d) None of these

49. The orbit of communication satellite is

- a) Elliptical b) Hyperbolic
- c) Circular d) Parabolic
- 50. The logic gate that gives high output only if the inputs are same is
 - a) NOR b) XOR
 - c) XNOR d) NAND

- 51. At 0K intrinsic semi conductors behave as
 - a) Conductors
 - b) Super conductors
 - c) Semi-conductors
 - d) Insulators
- 52. Which of the following is used to study the wave nature of electrons is
 - a) Stern Gerlach experiment
 - b) Davisson Germer experiment
 - c) Hertz experiment
 - d) Rutherford scattering experiment
- 53. Which one of the following is a Fermion?
 - a) Photon
 - b) Meson
 - c) Electron
 - d) α -particle
- 54. The input control parameter of JFET is
 - a) Source voltage b) Gate voltage
 - c) Drain voltage d) Gate current
- 55. In CsCI crystal Cs occupies the corners and CI occupies the body centre. The crystal structure is
 - a) Body centred cubic b) Simple cubic
 - c) Face centred cubic d) All of the above

- 56. One Tesla of magnetic field is equal to
 - a) 10^4 Gauss b) 10^3 Gauss
 - c) 10^2 Gauss d) 10^6 Gauss
- 57. PT 100 is a device used to measure
 - a) Heart beats
 - b) Temperature in terms of resistance
 - c) Solar flux on earth
 - d) Flow rate of liquids
- 58. A man is standing between two parallel cliffs and fires a gun. He hears the first and second echoes after 1.5s and 3.5s respectively. If the velocity of sound in air is 340m/s the distance between the cliffs is
 - a) 1050 m b) 750 m c) 850 m d) 950 m
- 59. In an npn transistor, the collector current is 24mA. If 80% of electrons reach collector, the base current in mA is
 - a) 4 mA
 - b) 8 mA
 - c) 6 mA
 - d) 20 mA
- 60. Human eye is more sensitive to
 - a) Red b) Green
 - c) Blue d) Violet

ANSWER SHEET — PART – A



21	А	В	С	D	Е
22	А	В	С	D	Е
23	Α	В	С	D	Е
24	А	В	С	D	Е
25	А	В	С	D	Е
26	А	В	С	D	Е
27	А	В	С	D	Е
28	А	В	С	D	Е
29	А	В	С	D	Е
30	А	В	С	D	Е
31	А	В	С	D	Е
32	А	В	С	D	Е
33	А	В	С	D	Е
34	А	В	С	D	Е
35	А	В	С	D	Е
36	А	В	С	D	Е
37	А	В	С	D	Е
38	А	В	С	D	Е
39	А	В	С	D	Е
40	А	В	С	D	Е



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PART – B

(Descriptive Type)

Answer **any eight** questions.

(8 × 5 = 40 Marks)

- 1. Derive the wave equation for an electromagnetic wave from Maxwell's equations.
- 2. Discuss the propagation of light through an optical fiber. Distinguish between step index fiber and graded index fiber.
- 3. Explain the principle and working of LED.
- 4. What is population inversion? Explain how this is achieved in lasers.
- 5. What is Raman effect? Explain quantum theory of Raman effect.
- 6. What is superconductivity? Explain few important applications.
- 7. Discuss the classification of elementary particles.
- 8. With a neat diagram explain the working of RC phase shift oscillator.
- 9. Explain the working of master slave JK flip-flop.
- 10. Arrive at the expression for the band width in Young's double slit experiment.
- 11. Explain the working of Zener diode as a voltage regulator.
- 12. With a neat diagram, briefly discuss the internal architecture of 8085 microprocessor.