SRINIVAS UNIVERSITY

SRINIVAS INSTITUTE OF TECHNOLOGY, VALACHIL
FIRST SEMESTER QUESTION BANK
COURSE CODE: BTF001
COURSE NAME: APPLIED PHYSICS IN ENGINEERING
CREDITS: 04

Q. NO.	Objective Type of Questions	Module	Mark for each question
1.	According to Planck's quantum theory, the energy of an oscillator is given by: a) E=nhν b) E=2hν c) E=mv d) E=h/p Answer: a) E=nhν	1	1
2.	Population inversion refers to: a)More atoms in ground state b) More atoms in excited state c) Equal atoms d) Random distribution Answer: b) More atoms excited	1	1
3.	The required condition to achieve LASER action in a system is a) Population inversion b) Metastable state c) Resonant cavity d) All of these Answer: d) All of these	1	1
4.	Important characteristic of LASER beam is a) Interference b) Diffraction c) Coherence d) Polarisation Answer: c) Coherence	1	1
5.	Which of the following is not a LASER property? a) Narrow bandwidth b) Highly coherent c) Highly directional d) Highly divergent Answer: d) Highly divergent	1	1
6.	The life time of an atom in a metastable state is of the order of a) Few milliseconds b) Few seconds c) Few nanoseconds d) Few picoseconds Answer: a) Few milliseconds	1	1
7.	Emission of a photon by an excited atom due to interaction of external energy is called a) Induced absorption b) Stimulated emission c) Spontaneous emission d) Total internal reflection Answer: b) Stimulated emission	1	1
8.	Rate of induced absorption depends on a) Number of atoms in lower energy state b) Energy density c) Number of atoms in higher energy state d) Both a and b Answer: d) Both a and b	1	1

9.	Which type of semiconductor is used for laser diodes? a) Direct bandgap b) Indirect bandgap c) Both types d) Insulator Answer: a) Direct bandgap	1	1
10.	In a laser printer, the laser is used to: a) Print directly on paper b) Create image on photosensitive drum c) Cut paper d) Heat toner Answer: b) Create image on photosensitive drum	1	1
11.	In laser cutting, oxygen gas is used to: a) Reduce wavelength b) Cool cutting zone c) Burn material and assist cutting d) Focus beam Answer: c) Burn material and assist cutting	1	1
12.	The working of a laser barcode scanner is based on: a) Absorption of UV light b) X-ray diffraction c) Fluorescence from barcode material d) Reflection of laser beam from black and white bars Answer: d) Reflection of laser beam from black and white bars	1	1
13.	Optical fibers work on the principle of: a)Total Internal Reflection b)Diffraction c)diffraction d)polarization Answer: a)Total Internal Reflection	2	1
14.	The parameter that determines the number of modes in an optical fiber is: a) V-number b) Attenuation c) Bandwidth d) Jacket thickness Answer: a) V-number	2	1
15.	Attenuation in optical fiber is caused by: a) Absorption, scattering, and radiation losses b) Only scattering c) Only bending d) Only absorption Answer: a) Absorption, scattering, and radiation losses	2	1
16.	The attenuation coefficient of an optical fiber is expressed in: a) dB/km b) Watt/second c) Ampere/meter d) Hertz Answer: a) dB/km	2	1
17.	The carrier wave which is not used in long-distance communication is: a) Microwave b) Radio wave c) Ultrasonic wave d) Light wave Answer: c) Ultrasonic wave	2	1
18.	Optical fiber is a: a) Signal generator b) Waveguide c) Oscillator d) Amplifier Answer: b) Waveguide	2	1

19.	Erbium-doped fibers have long _____ states leading to coherent amplification: a) Metastable b) Ground c) Neutral d) Steady Answer: a) Metastable	2	1
20.	Optical detector used in fiber optic communication is: a) LED b) Laser c) APD d) Zener diode Answer: c) APD	2	1
21.	The function of cladding in an optical fiber is to: a) Increase signal strength b) Provide mechanical strength c) Confine light within the core d) Generate optical signal Answer: c) Confine light within the core	2	1
22.	The fractional refractive index change of an optical fiber with core RI = 1.563 and cladding RI = 1.498 is: a) 0.044 b) 0.1386 c) 0.004 d) 0.0416 Answer: d) 0.0416	2	1
23.	The wavelength in micrometer at which Erbium-Doped Fiber Amplifier (EDFA) works is around: a) 0.85 μm b) 1.06 μm c) 1.36 μm d) 1.54 μm Answer: d) 1.54 μm	2	1
24.	For single-mode operation of optical fiber, V-number must be: a) $V > 5$ b) $V < 1$ c) $V < 2.405$ d) $V = 0.5$ Answer:c) $V < 2.405$	2	1
25.	A cantilever is a beam supported at: a) Both ends b) One end only c) More than two points d) No support Answer: b) One end only	3	1
26.	Stress is defined as: a) Force/length b) Change in length/original length c) Force/area d) Energy/volume Answer: c) Force/area	3	1
27.	Strain is defined as: a) Force/volume b) Energy/area c) Force/area d) Change in dimension/original dimension Answer: d) Change/original	3	1
28.	Hooke's law is valid: a) Plastic range b) Elastic limit c) Yield point only d) Fracture point Answer: b) Elastic limit	3	1
29.	The effective spring constant for two springs of constants k1 and k2 in series is: a) k_1+k_2 b) k_1-k_2 c) $(k_1k_2)/(k_1+k_2)$ d) k_1/k_2 Answer: c) $(k_1k_2)/(k_1+k_2)$	3	1
30.	On the stress–strain curve of mild steel, the maximum stress the material can withstand (ultimate tensile strength) occurs at: a) Proportional limit b) Yield point c) Ultimate stress point d) Fracture point Answer: c) Ultimate stress point	3	1

31.	The maximum theoretical value of Poisson's ratio is: a) 1 b) 0.5 c) −1 d) 2 Answer: b) 0.5	3	1
32.	The ultimate strength of a material corresponds to: a) Proportional limit b) Yield point c) Ultimate stress point d) Fracture point Answer: c) Ultimate stress point	3	1
33.	An I-beam is widely used in construction because: a) Reduce shear stress b) Reduce bending stress c) Increase density d) Are cheaper Answer: b) Reduce bending stress	3	1
34.	The relation between Young's modulus (Y), rigidity modulus (n), and Poisson's ratio (σ) is: a) $Y=3n(1-2\sigma)$ b) $Y=n(1+\sigma)$ c) $Y=2n(1+\sigma)$ d) $Y=3n(1+\sigma)$ Answer: c) $Y=2n(1+\sigma)$	3	1
35.	A wire obeys Hooke's law up to a certain load. If the load is doubled within the elastic limit, which of the following quantities does NOT necessarily double? a) Stress b) Strain c) Young's modulus d) Extension Answer:c) Young's modulus	3	1
36.	Two springs of spring constants k1=600 N/m and k2=300 N/m are connected in series. The combination is stretched by a force of 12 N. What is the total extension produced? a) 0.06 m b) 0.08 m c) 0.02 m d) 0.04 m Answer: a) 0.06 m	3	1
37.	Wavefunction associated with a material particle is a) Single valued b) Continuous c) Finite d) All of these b) Answer: d) All of these	4	1
38.	According to uncertainty principle, it is not possible to determine accurately the simultaneous values of position and _____ of a particle at any time. a) Mass b) Momentum c) Energy d) Time Answer: b) Momentum	4	1
39.	According to Moore's law, the number of tiny switches called transistors on a computer chip _____ about every two years. a) Remains same b) Doubles c) Increases 10 times d) Reduces to half Answer: b) Doubles	4	1
40.	A single qubit's state can be represented as a point on a unit sphere called the a) de-Broglie sphere b) Moore sphere c) Quantum sphere d) Bloch sphere Answer: d) Bloch sphere	4	1
41.	Which quantum gate is working like a classical NOT gate? a) Pauli X gate b) CNOT gate c) T gate d) Pauli Z gate Answer: a) Pauli X gate	4	1
42.	Which Quantum gate is used to create superposition, making a qubit be both $\|0\rangle$ and $\|1\rangle$ at the same time? a) Pauli Y gate b) Pauli X gate c) Hadamard gate d) T gate Answer: c) Hadamard gate	4	1

43.	When two qubits become connected, they form a special link called a) Resonance b) Decoherence c) Entanglement d) Interference Answer: c) Entanglement	4	1
44.	Kinetic energy of electron accelerated by a voltage 50 Volts a) 50 eV b) 5 eV c) 500 eV d) 15 eV Answer: a) 50 eV	4	1
45.	An electron has a speed of 100 m/s, accurate to 0.005%. The uncertainty in its position is a) 0.01 m b) 0.024 m c) 0.036 m d) 0.0115 m Answer: d) 0.0115 m	4	1
46.	If the momentum of a particle is increased to four times, the de-Broglie wavelength is a) Twice b) Half c) One-fourth d) Four times Answer: c) One-fourth	4	1
47.	de-Broglie wavelength of an electron accelerated by a potential of 60 V is a) 1.85 Å b) 1.58 Å c) 1.62 Å d) 1.56 Å Answer: b) 1.58 Å	4	1
48.	Operation of CNOT gate for input $\|11\rangle$ yields an output a) $\|11\rangle$ b) $\|10\rangle$ c) $\|01\rangle$ d) $\|00\rangle$ Answer: b) $\|10\rangle$	4	1
49.	Frames per Second standard adopted in India is a) 60 b) 24 c) 25 d) 30 Answer: c) 25	5	1
50.	Different regions adopted different FPS standards because early television technology had to synchronize with the local a) People b) Electrical power grid c) Business class d) Government Answer: b) Electrical power grid	5	1
51.	When acceleration is constant, one can use the _____ to time the frames. a) Odd rule b) Even rule c) Hund's rule d) Multiple rule Answer: a) Odd rule	5	1
52.	A motion graph plots an object's position against a) Mass b) Time c) Gravity d) Speed Answer: b) Time	5	1
53.	In walking, _____ describes how each foot moves through stance (on ground) and swing (in air) phases. a) Gait b) Stride length c) Space d) Step length Answer: a) Gait	5	1
54.	Constant net force applied to a moving object opposite to its motion results in: a) Acceleration b) Deceleration c) Constant speed d) Free fall Answer: b) Deceleration	5	1
55.	Push Time in a jump can be calculated as: a) Push height / Stop height b) Stop height / Jump height c) Push distance / Stop time d) (Push time × Stop distance) / Push height Answer: d) (Push time × Stop distance) / Push height	5	1
56.	Muscle and bone strength is proportional to: a) Length b) Volume c) Cross-sectional area d) Mass Answer: c) Cross-sectional area	5	1
57.	If a man weighing 80 kg can lift 40 kg, then scaling his height by 2 will increase his weight by a factor of:	5	1

	a) 2 b) 4 c) 6 d) 8 Answer: d) 8		
58.	Base distance for jump with constant acceleration over 5 frames, total distance 0.4 m is: a) 0.4 m b) 0.045 m c) 0.025 m d) 0.25 m Answer: c) 0.025 m	5	1
59.	Inverse kinematics refers to a) Knowing start point only b) Knowing mass and force c) Curved motion d) Knowing start and end points Answer: d) Knowing start and end points	5	1
60.	Frames per Second standard adopted in India is a) 60 b) 24 c) 25 d) 30 Answer: c) 25	5	1

Q. NO.	Essay Type of Questions	Module	Mark for each question
1	State and Explain Planck's law of radiation. Write a note on characteristics of LASER.	1	8
2	Discuss the possible ways through which radiation and matter interaction takes place. Write a note on medical applications of LASER.	1	8
3	Explain the essential conditions required for laser action.	1	8
4	Write notes on LASER welding, cutting and drilling.	1	8
5	Describe with energy band diagram the construction and working of semiconductor diode laser.	1	8
6	Obtain an expression for energy density of radiation under equilibrium condition in terms of Einstein's coefficients.	1	8
7	What is pumping? Explain the application of laser in Bar code scanner.	1	8
8	What is the role of resonant cavity in a laser system? The average output power of LASER source emitting a LASER beam of wavelength 6328 Å is 5 mW. Find the number of photons emitted per second.	1	8
9	Explain the application of laser in Laser printer. A medium in thermal equilibrium at temperature 300 K has two energy levels with a wavelength separation of 1 μm. Find the ratio of population densities of the upper and lower levels.	1	8
10	Mention the advantages and disadvantages of laser printer. Calculate on the basis of Einstein's theory the number of photons emitted per second by He–Ne LASER source emitting light of wavelength 6328 Å with an optical power 10 mW.	1	8
11	Write a note on advantages and disadvantages of semiconductor laser. The average output power of LASER source emitting a LASER beam of wavelength 6328 Å is 5 mW. Find the number of photons emitted per second.	1	8

12	Why silicon and germanium are not used for the fabrication of semiconductor laser? Find the number of modes of the standing waves and their frequency separation in a resonant cavity of length 1 m of laser operating at wavelength 632.8 nm.	1	8
13	Write a note on total internal reflection. Mention the advantages of optical fibers when used for communication.	2	8
14	Explain the different types of optical fibers.	2	8
15	What is attenuation? Write a note on attenuation mechanisms.	2	8
16	Explain point to point communication using optical fiber with the help of a block diagram.	2	8
17	Write a note on PCS fiber. What is V-parameter of a fiber? Explain.	2	8
18	Derive the expression for numerical aperture and acceptance angle of an optical fiber.	2	8
19	Write a note on optic fiber construction and fiber dimension. Write a note on medical applications of optical fiber.	2	8
20	Explain the working of Erbium doped fiber amplifier (EDFA).	2	8
21	Mention different types of fiber amplifiers. An optical fiber has a core refractive index 1.55 and cladding refractive index 1.50. Calculate numerical aperture, acceptance angle and fractional index change.	2	8
22	Explain how optical fibers are used for mechanical inspections. Calculate the V-number for a fiber of core diameter 40 μm with refractive indices 1.55 and 1.50 when wavelength is 1400 nm. Calculate number of modes.	2	8
23	What is fractional index change? How is it related to numerical aperture? An optical fiber 600 m long has input power 120 mW and output power 90 mW. Find attenuation.	2	8
24	Explain how optical fibers are used for mechanical inspections. The attenuation is 2.2 dB/km. What fractional intensity remains after 2 km and 6 km?	2	8
25	With neat diagram explain the stress–strain curve for elastic materials.	3	8
26	Define Poisson's ratio. Discuss its limiting values.	3	8
27	Define Young's modulus (Y), bulk modulus (K) and rigidity modulus (n).	3	8
28	Derive the expression for bending moment in terms of moment of inertia.	3	8
29	What are different types of beams used in engineering practice? Explain their significance with applications.	3	8
30	Explain a cantilever beam with neat sketch. Mention its engineering applications.	3	8
31	Define force constant of a spring. Explain its significance. Derive expression for equivalent force constant for springs in series and parallel.	3	8
32	Write notes on strain hardening and strain softening. Calculate force required to produce extension of 1 mm in a steel wire of length 2 m and diameter 1 mm.	3	8

33	Write the expression for bending moment for rectangular cross section. A water column of length 1 m is subjected to pressure 2.05×10^9 N/m^2. Calculate piston movement.	3	8
34	Write the expression for bending moment for circular cross section. Calculate extension in a wire of length 2 m under force 14.7 N.	3	8
35	Define Poisson's ratio. A solid lead sphere of radius 10.3 m is subjected to pressure 10 N/m^2. Find change in volume.	3	8
36	Discuss the design features of an I-section girder. Explain why most of the material is placed away from the neutral axis?	3	8
37	Explain Heisenberg's uncertainty principle and its physical significance.	4	8
38	What is wavefunction? Explain its properties and physical significance.	4	8
39	Explain Pauli gates used in quantum computation.	4	8
40	State and explain de-Broglie's hypothesis.	4	8
41	What is Moore's Law? Discuss limitations of VLSI.	4	8
42	Explain the working of Phase Gates (S and T).	4	8
43	What are matter waves? Calculate de-Broglie wavelength of a bullet of mass 5 g moving at 20 km/hr.	4	8
44	Compare classical and quantum computation. Distinguish between bits and qubits.	4	8
45	Using uncertainty principle, prove that free electron cannot exist inside nucleus.	4	8
46	Write uncertainty relation for energy and time. Estimate excited state lifetime for wavelength 546 nm and width 10^{-14} m.	4	8
47	Explain the quantum gate used to create superposition.	4	8
48	Explain the working of Controlled-NOT (CNOT) gate.	4	8
49	Elucidate the importance of size & scale and weight and strength in animations.	5	8
50	Write a note on frames per second and Describe motion graph in animation.	5	8
51	Describe walking and explain steps and strides.	5	8
52	Explain jump magnification with mathematical expressions.	5	8
53	Explain odd rule and odd rule multipliers with example.	5	8
54	Explain Landing and stop time. Write the proportional relation in terms of frames. Write the proportional relation in terms of time.	5	8
55	Define gait and explain walking gait.	5	8
56	Discuss timing in linear motion, Uniform motion, slow in and slow out.	5	8
57	Describe Jumping and parts of jump. The jump animation is associated with a Push Time of 5 frames. Push Height 0.4m and Stop Height 0.5m. Calculate the Stop time. Express the push time and stop time in second if the animation is played at 30fps.	5	8
58	In a case of animating a jump the Push Height is 0.5m and the JM is 5. Calculate the Jump Height and Push Acceleration. Given Gravitational Acceleration 10ms-^{2}.	5	8
59	Write a note on PAL and NTSC with numerical problems.	5	8
60	State and explain the odd rule. Given the base distance 0.5 cm for the slow out Calculate the distance between the frames a. #4 and #5 b. #1 and #7.	5	8