SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: February 2021 – June 2021 **Examination: ESE Examination**		
Programme code: 01 **Programme: B.TECH**	**Class:** FY	**Semester: I (KT) & II (Reg) (SVU 2021)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**		**Name of the Department** All Branches
Course Code: 116U06C102	**Name of the Course: Engineering Physics**	
Duration : 1 Hour 45 Minutes	**Maximum Marks : 50**	
Instructions: 1)Draw neat diagrams **2) Values of the constants: h=6.634x10^{-34} J s, ε_0= 8.85x10^{-12} F/m, N=6.023x10^{23} / mole**		

Question No.		Max Marks
Q 1 (A)	**Attempt All** **i. Solar cell works based on** (a) Laser technology (b) Photo-conduction (c) Thermal emission (c) Tyndall effect **ii. A beam of electrons and another beam of protons (each particle has an energy of 6.5 eV), are incident separately on two identical barriers respectively each of 10.2 eV high and 10 Å wide. Which of the following is a CORRECT statement?** (a) The electron will have greater transmission compared to proton. (b) The proton will have greater transmission compared to electron. (c) Both electron and proton will have equal transmission probabilities. (d) Neither electron nor protons can cross the barrier. **iii. In reference with antireflection coating which of the following statement is true?** (a) Thickness of the film should be changed for light of same wavelength but different intensity (b) Thickness of the film need not be changed for light of same wavelength but different intensity **(c)** Thickness of the film should be increased for light of same wavelength but higher intensity **(d)** Thickness of the film should be decreased for light of same wavelength but higher intensity **iv. If the particle is moving in a _____ potential then the solution of the wave equation are describe as a stationary states** (a) Time independent (b) Time dependent (c) Velocity dependent (d) Velocity independent	10 (1 x 10)

	v. The divergence of a vector is a scalar, while the curl of a vector is another (a) Scalar (b) Unit vector (c) Vector (d) displacement vector **vi. The following are the cause of light attenuation in fibre optics except** (a) Backscattering (b) Absorption (c) Refraction (d) Micro-bends **vii. For a semiconductor-based light source, it should be a** (a) direct bandgap semiconductor (b) indirect direct bandgap semiconductor (c) either direct bandgap or indirect bandgap (d) the semiconductor cannot be used as a light source **viii. The polarization of dielectric materials results in** (a) Absorption of electrons (b) Release of high velocity protons (c) creation of electric dipoles (d) production of eddy currents **ix. The smallest change which a sensor can detect is termed as** (a) Accuracy (b) Precision (c) Resolution (d) Scale **x. LCDs operate from a voltage ranges from _____** (a) 3 to 15V (b) 10 to 15V (c) 10V (d) 5V	
Q 1 (B)	**Attempt any FIVE questions out of the following (any 5 out of 7)** **i.** Find the divergence of a vector field $F = 3x^2\,i + 2zy^2\,j + y^3z\,k$ at (-2, 3, 4). **ii.** Why high frequencies radiations not suitable for the production of LASER light? **iii.** What are the necessary conditions of a physically acceptable wave-function? **iv.** Calculate the ratio of spontaneous emission to stimulated emission if the wavelength of the radiation is 5500 Å at 2000 K. **v.** Calculate the natural frequency of 40 mm length of a pure iron rod. Given the density of pure iron is 7.25×10^3 kg/m^3 and its Young's modulus is 11.5×10^9 N/m^2. Can you use it in Magnetostriction oscillator to produce ultrasonic waves?	10 (2 x 5)

	vi. Find angle of polarization and angle of refraction if refractive index of the material used as polarizer is 1.45. **vii.** What are the important characteristics of ferroelectric materials?	
Q 2	**Attempt all** **i.** The thermos e.m.f of a Cu-Fe thermocouple of 2160 μV when the cold junction is at 0 °C and the hot junction at 250 °C. Calculate the constants *a* and *b* if the neutral temperature is 330 °C. **ii.** Explain the principle, construction and working of a Nicol Prism with a neat diagram.	10 (5 x 2)
Q 3	**Attempt any TWO** **i.** Explain briefly pumping schemes used in laser. Explain why two level laser systems is not possible? **ii.** Discuss the frequency dependence of various polarization processes in dielectric materials? **iii.** Consider a step index multimode optical fibre having core and cladding RI of 1.56 and 1.48 respectively. Calculate the maximum bit rate for optical data transmission from this fibre of length 30 km. What would be the bit rate if this fibre were graded index? Assume material dispersion offered by fibre in both cases be 1.8 ns/km.	10 (5 x 2)
Q 4	**Attempt any TWO** **i.** With a neat and labelled schematic, discuss the behaviour of the fermi level of a n-type semiconductor when the temperature changes from low regime to high regime. **ii**. Starting from the Schrodinger's time independent equation, show that the energy of a particle in one dimensional potential well of infinite height is quantized. **iii**. Find the probability that a particle trapped in a box L wide can be found between 0.25 L and 0.45 L for the ground state and first excited state.	10 (5 x 2)