Subject: Engineering Physics/18PHY12

Q No.	Problems	VTU QP year	Marks	CO's
	Module 1			
1.	A free particle is executing simple harmonic motion in a straight line with a period of 25 seconds; 5seconds after it has crossed the equilibrium point, the velocity is found to be 0.7m/s. Find the displacement at the end of 10 seconds and also amplitude of oscillations.	I sem 2018-19	5	CO1
2.	A mass of 0.5kg causes an extension of 0.03m in a spring and the system is set for oscillations. Find i) The force constant for the spring ii) angular frequency and iii)time period of the resulting oscillation.	I sem 2018-19	5	CO1
3.	For a particle executing SHM, its acceleration is found to be 15cm/s^2 when it is at 3cm from its mean position. Calculate time period.	II sem 2018-19	5	CO1
4.	A 20g oscillator with natural angular frequency 10 rad/s is vibrating in damping medium. The damping force is proportional to the velocity of the vibrator. Calculate the value of damping required for the oscillations to be critically damped.(given damping coefficient is 0.17)	II sem 2018-19	5	CO1
5.	Calculate the resonant frequency for a simple pendulum of length 1m	I sem 2019-20	5	CO1
6.	The distance between the two pressure sensors in a shock tube is 150mm. The time taken by a shock wave to travel this distance is 0.3ms. If the velocity of sound under the same condition is 340m/s. Find the Mach number of the shock wave.	I sem 2019-20	5	CO1
	Module 2			
7.	Calculate the torque required to twist a wire of length 1.5m, radius 0.0425x10^{-2}m through an angle of (π/45) radians, if the value of rigidity modulus of the material is 8.3x10^{10}N/m$^{2.}$	I&II sem 2018-19	5	CO1
8.	Calculate the force required to produce an extension of 1mm in steel wire of length 2m and diameter 1mm.(Y=2x10^{11}N/m^2)	I&II sem 2018-19	5	CO1
9.	Calculate the twisting couple on a solid cylindrical rod of length 1.5m and radius 80mm when it is twisted through an angle 0.6^0. Rigidity modulus of the material of rod is 93x10^{9}N/m^2.	VTU model QP	5	CO1
10.	A rod of cross sectional area 1cm^2 is rigidly planted into the earth	VTU	5	CO1

	vertically. A string which can withstand a maximum tension of 2kg is tied to the upper end of the rod and pulled horizontally. If the length of the rod from the ground level is 2cm calculate the distance through which its upper end is displaced just before the string snaps.	model QP		
11.	Calculate the extension produced in a wire of length 2m and radius $0.013x10^{-2}$m due to a force of 14.7Newton applied along its length. Given, Young's modulus of the material of the wire $Y=2.1x10^{11}$ N/m^2	I sem 2019-20	5	CO1
12.	Calculate the angular twist of a wire of length 0.3m and radius $0.2x10^{-3}$m when a torque of $5x10^{-4}$ Nm is applied.(Rigidity modulus of the material is $8x10^{10}$N/m^2).	I sem 2019-20	5	CO1
	Module 3			
13.	Determine constant C, such that $A=(x+ay)a_x+(y+bz)a_y+(x+cz)a_z$ is solenoidal.	I sem 2018-19	5	CO2
14.	The refractive indices of core and clad are 1.50 and 1.48 respectively in an optical fiber. Find the numerical aperture and angle of acceptance.	I sem 2018-19	5	CO2
15.	A circular coil of radius 10cm and having 50 turns carries current of 5A. Determine the magnetic field produced by the coil at a distance of 3cm from the center. Also determine magetic field produced by the coil at its center .	II sem 2018-19	5	CO2
16.	Calculate the V number for a fiber of core diameter 40 μ m and with refractive indices of 1.55 and 1.5 respectively for core and cladding. When the wavelength of the propagating wave is 1400nm. Also calculate the number of modes that the fiber can support for propagation. Assume that the fiber is in air.	II sem 2018-19	5	CO2
17.	Find the divergence of the vector field A given by $A=6x^2a_x+3xy^2a_y+xyz^3a_z$	I sem 2019-20	5	CO2
18.	Find the attenuation in an optical fiber of length 500m When a light signal of power 100mW emerges out of the fiber with a power 90mW.	I sem 2019-20	5	CO2
	Module 4			
19.	A pulsed laser emits photons of wavelength 780nm with 20mW average power/pulse. Calculate the number of photons contained in each pulse if the pulse duration is 10ns.	I sem 2018-19	5	CO3
20.	An electron is bound in a one dimensional potential well of width $1A^0$, but infinite wall height. Find its energy values in the ground state and in the first two excited states.	I sem 2018-19	5	CO3
21.	The average output power of laser source emitting a laser beam of wavelength 632.8nm is 5mW. Find the number of photons emitted per second by the laser source.	I&II sem 2018-	5	CO3

		19		
22.	An electron is trapped in a 1-D potential well of infinite height and of width of 0.1nm. Calculate the energy required to excite it from its ground state to fifth excited state.	VTU model QP	5	CO3
23.	A particle of mass 0.5MeV/C^2 has kinetic energy 100eV. Find its de Broglie wavelength, where C is the velocity of light.	I sem 2019-20	5	CO3
24.	The ratio of population of two energy levels is $1.059x10^{-30.}$ Find the wavelength of light emitted by spontaneous emissions at 330K.	I sem 2019-20	5	CO3
	Module 5			
25.	Find the temperature of which there is 1% probability that a state with an energy 0.5eV above the Fermi energy is occupied.	I sem 2018-19	5	CO4
26.	The resistivity of intrinsic germanium at 27^0C is equal to 0.47 ohm-m. Assuming the electron and hole mobilities as 0.38 and 0.18m^2/V-sec respectively. Calculate the intrinsic carrier density.	I sem 2018-19	5	CO4
27.	The dielectric constant of sulphur is 3.4. Assuming a cubic lattice for its structure, calculate the electronic polarizability of sulphur(given, density of sulphur=2.07g/cc and atomic weight=32.07)	II sem 2018-19	5	CO4
28.	The intrinsic charge carrier concentration of germanium is $2.4x10^{19}$/m^3, calculate its resistivity if mobility of electrons and holes respectively are 0.39m^2/Vs and 0.19m^2/Vs.	II sem 2018-19	5	CO4
29.	Calculate the probability of an electron occupying an energy level 0.02eV above the Fermi level at 200K and 400K in a material.	I sem 2019-20	5	CO4
30.	An elemental solid dielectric material has polarizability$7x10^{-40}Fm^2$. Assuming the internal field to be Lorentz field, calculate the dielectric constant for the material if the material has $3x10^{28}$ atoms/$m^{3.}$	I sem 2019-20	5	CO4