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CMRIT
CMR INSTITUTE OF TECHNOLOGY, BENGALURU.
ACCREDITED WITH A+ GRADE BY NAAC

Internal Assessment Test 1 – March 2018

Sub:	Engineering Physics					Sub Code:	17PHY22	Branch:	All
Date:	13/03/2018	Duration:	90 mins	Max Marks:	50	Sem / Sec:	II/ A,B,C,D,E,F and G	OBE	

Answer any **FIVE FULL** Questions

Note: Value of Constants: $h = 6.625\times10^{-34}$Js $k = 1.38\times10^{-23}$ J/K $m = 9.11\times10^{-31}$ kg.
$e = 1.6 \times 10^{-19}$C, $c = 3\times10^{8}$ m/s

		MARKS	CO	RBT
1 (a)	What are the assumptions made in the Planck's quantum theory of black body radiations? Obtain the expressions for Wien's law and Rayleigh-Jeans law using Planck's law of black body radiation.	[07]	CO1	L3
(b)	If the wavelength of the maximum intensity (black body radiation) emitted by the sun is at 490 nm calculate the temperature of the sun (given that Wien's constant is 2.898×10^{-3} m-K).	[03]	CO1	L2
2 (a)	Define phase velocity and group velocity. Derive the relation between group velocity and phase velocity.	[06]	CO1	L2
(b)	What are matter waves? Calculate the de-Broglie wavelength of the electron accelerated through a potential difference of 100 **k**V.	[04]	CO1	L3
3 (a)	Show that an electron cannot exist inside the nucleus using Heisenberg's uncertainty principle.	[07]	CO1	L3
(b)	Calculate the minimum uncertainty in the measurement of frequency of a photon that is emitted by the de-excitation of an atom, if the life time of the excited state is 10 **μs.**	[03]	CO1	L3

4 (a)	What is Compton effect? Calculate the wavelength of the X-rays scattered by the electron at 180º, if the wavelength of incident X-ray is 1.5 Å.	[04]	CO1	L3
(b)	Derive time independent Schrodinger wave equation for one dimension.	[06]	CO1	L2
5 (a)	Derive the expression for energy Eigen value and Eigen function for a particle in a one dimensional potential well of infinite height.	[07]	CO1	L3
(b)	An electron is bound in a one dimensional potential well of width 1 nm. Find the energy values (in eV) of the electron in the ground state and second excited state.	[03]	CO1	L2
6 (a)	Explain the merits of quantum free electron theory.	[06]	CO2	L2
(b)	What is Fermi factor? Calculate the probability of occupation of an energy state 0.02 eV above the Fermi level at temperature T = 300 K.	[04]	CO2	L3

7 (a)	Obtain an expression for the electrical conductivity of a metal from quantum mechanical consideration.	[07]	CO2	L3
(b)	What are the assumptions of classical free electron theory	[03]	CO2	L1