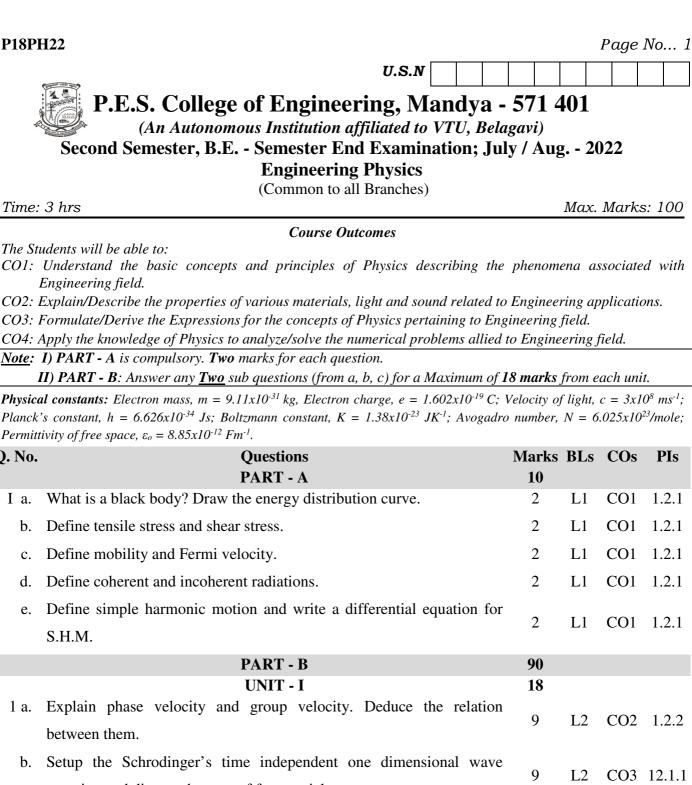
Q. No.

I a.

b.

C.



equation and discuss the case of free particle.

i) Prove that the electron does not exist inside the nucleus of an atom. 5 C.

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ii) A particle of mass 0.65 MeV/c<sup>2</sup> has kinetic energy 80 eV. Find deBroglie wavelength, particle velocity and phase velocity of the L2 4 CO4 2.1.1 deBroglie wave.

	UN11 - 11	18		
2 a.	State Hooke's law for elasticity. Obtain the expression for bending	0	9 L1,2 CO1,3	1.2.1
	moment of a beam with rectangular cross section.	9		2.1.1
b.	Mention different types of Polarization mechanisms. Derive Clausius-	0	L1,2 CO1,3	1.2.1
	Mosssotti relation for a dielectric solid.	9		2.1.1

L2

10

CO2 1.2.2

P18PH22				Page I	No 2
c.	i) Explain the applications of dielectrics in transformers.	5	L2	CO2	1.2.2
	<ul> <li>ii) A solid elemental dielectrics has a density 3.08 x 10<sup>28</sup> atoms/m<sup>3</sup> and its relative permittivity is 4. Calculate electronic polarizability.</li> </ul>	4	L2	CO4	2.1.2
	UNIT - III	18			
3 a.	Define Fermi energy and Fermi factor. Discuss the probability of occupation of energy by electrons at temperatures $T > 0$ K and $T = 0$ K using Fermi factor.	9	L1,2	CO1,2	1.2.1 2.1.1
b.	Explain Fermi level in an intrinsic semiconductor. Deduce an expression for intrinsic carrier concentration and conductivity of a semiconductor.	9	L2	CO2,3	1.2.2 2.1.1
c.	What are the merits of a classical free electron theory? Explain how quantum free electron theory overcomes the failures of classifical free electron theory.	9	L1,2	CO1,2	1.2.1 1.2.2
	UNIT - IV	18			
4 a.	Explain population inversion for laser action. Deduce the expression for radiant energy density in terms of Einstein's co-efficient.	9	L2	CO2,3	1.2.2 2.1.1
b.	Define acceptance angle and numerical aperture with neat diagram. Derive an expression for numerical aperture in terms of refractive indices of core and cladding of an optical fibre.	9	L1,2	CO1,3	1.2.1 2.1.1
c.	<ul> <li>i) Find the ratio of population of two energy levels out of which one corresponds to meta stable state, if the wavelength of light emitted at 330 K is 633 nm.</li> </ul>	4	L2	CO4	2.1.2
	ii) Calculate the number of modes that can be propagated inside the optical fibre if core radius 50 $\mu$ m and wavelength of light 1 $\mu$ m. Given n <sub>core</sub> =1.53 and n <sub>clad</sub> = 1.5.	5	L2	CO4	2.1.2
	UNIT - V	18			
5 a.	Explain briefly Type–I and Type–II superconductors.	9	L2	CO2	
b.	What are damped vibrations?	9	L1	CO1	1.2.1
	Discuss the theory of damped vibrations.		L2		1.2.2
c.	i) Explain the acoustical requirements for the good auditorium.	5	L2	CO2	
	ii) Mention the four important application of ultrasonics.	4	L1	CO1	1.2.1