Total	No. o	f Qu	estions: 9]	Ó		SEAT No.:
PD4025				2		[Total No. of Pages : 4
			[64	401]-1902	2	
				F.E.		
			ENGINE	ERING P	HYS	SICS
	(20)19	Pattern) (Credit Sy	ystem) (S	eme	ester - I/II) (107002)
Time	: 2½ 1	Hour	sl S			[Max. Marks : 70
			he candidates:			
			on No. 1 is compulsory.			
			es to the right indicate fu to suitable data if necessa			
		- (e sutuatie data tj necessa electronic calculator is d	=		\$
	., .	se oj				:0'
Cons	stants	:-		1		O Static Co.
1)		9	electron = $Me = 9.1 \times 1$	0^{-31} kg		50,
2)		` V	n electron = $e = 1.6 \times 1$		Y	£
3)	\>	ζ.	$constant = h = 6.63 \times 1$		2	· ·
,				3	(2)	Y
<i>Q1</i>)	Write	e cor	rect option of given qu	estions w	th an	nswer (one mark each) [10]
~	a)			/_/'		th moving with speed
	,		parable to the speed o	/ / -		
		i)	Electron	i	i) I	Proton
		iii)	Neutron	i	v) A	All of the above
	b)	De I	Broglie hypothesis is a	pplicable f	or	
		i)	Matter particles	i	*	Electromagnetic waves
		iii)	Mechanical waves	i	v) 1	None of the above
	c) 🤚	Heis	senberg's uncertainty p	orinciple is	abou	ut the of position and
	-	mor	nentum of a particle.			
		i)	Difference	i	i) A	Addition
4		iii)	Multiplication			Division
	d)	Whi	ch of the following rep	present con	rect	ordering for band gap energy?
		i)	Metal > Semiconduct	tor > Insul	ator	
		ii)	Metal < Semiconduct	tor < Insul	ator	
1		iii)	Metal < Semiconduct		()	
		iv)	Metal > Semiconduct	tor < Insul	ator	y •
				(

	e)	Hall	l effect is true for	~	
		i)	Metals only	(ii)	P-type semiconductors only
		iii)	N type semiconductors	iv)	All of the above
	f)			eld stre	ngth (H), magnetization(M) and
		susc	ceptibility(X) is		, 0
		i)	X = M/H	ii)	X = M + H
		iii)	$X = M \times H$	iv)	X = H/M
	g)	The	magnetism produced in an a	itom is l	because of
		i)	Orbital motion of electron		
		ii)	Spin motion of electron		Q_{j}
		iii)	Spin motion of nucleus		\$
		iv)	Combined effect of a, b, c		
	h)	Belo	ow eritical temperature, resis	tance o	f superconductor is and
		it ha	conductivity.	V	
		i)	Infinite, zero	ii)	Unity, Unity
	6	iii)	Zero, Infinite	O _{IV})	Infinite, infinite
	i)		are performed to estin	nate inte	ernal defects in the materials.
		i)	Destructive testing	(iii)	Non-Destructive testing
		iii)	Both (i) & (ii)	iv)	None of (i) and (ii)
	j)	Nan	omaterials has at least one di	mension	n in the range.
		i)	1 to 100 nm	ii)	100 to 1000 nm
		iii)	1 to 10 μm	iv)	Greater than 10 µm
Q2)	a)	Der	ive the expression for the end	ergy of a	a particle enclosed in an infinite
		pote	ential well.		[6]
	b) 🐗	Stat	e and explain Heisenberg's un	ncertain	ty principle. [5]
	c)	Calc	culate wavelength of matter w	aves as	sociated with an electron having
		ener	gy 10eV.		(4)
4			OR		
Q3)	a)	Der	ive schrodinger's time indepe	endent e	quation. [6]
	b)	State	e and explain de Broglie hyp	othesis	of matter waves. Write any two
		prop	perties of matter waves.		[5]
1	c)			ociated	with an electron enclosed in a
		pote	ential well of length 2AV.	2	[4]
				OV	

Q4)	a)	With a suitable diagram. Explain Hall effect. Derive expression for Hall Voltage. [6]
	b)	Define efficiency of solar cell. State any four measures to improve efficiency of solar cells. [5]
	c)	Calculate number of acceptor atoms that are required to be added to an intrinsic silicon to achieve a resistivity of 10 ohm-cm. [Given - mobility of holes 500cm²/V.S] [4]
Q5)	a)	OR Derive the expression for conductivity of intrinsic and extrinsic semiconductors. [6]
	b)	Define Fermi level in conductor. Using Fermi-Dirac distribution function. Calculate the probability of finding electrons at T = 0 K for energy levels. [5]
		$\begin{array}{cccccccccccccccccccccccccccccccccccc$
	c)	A strip of copper of thickness 1.5×10^{-4} m is placed in a magnetic field of 1T acting along its thickness; A current of 10A is setup along its length. The voltage developed across width is $5\mu V$. Calculate concentration of charge carriers. [4]
Q6)	a)	Explain how the information is recorded and retrieved (read) in magnetic storage devices. [6]
	b)	i) Magnetic field strength (H) ii) Magnetization (M) Write relation between them.
	4	i) Magnetic field strength (H)
		ii) Magnetization (M)
\wedge		Write relation between them.
	c)	The critical temperature for lead is $Tc = 7.18k$, critical magnetic field at 0 K , $H_c(O) = 6.5 \times 10^4 \text{ A/M}$. Calculate critical magnetic field $H_c(T)$ at $T = 4.2k$.
		OR OR
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<i>Q7</i>)	a)	State and explain meissner effect. Show that super conductors are perfect diamagnetic. [6]
	b)	Define critical magnetic field. Differentiate between type I & type II super conductors. (Any two points). [5]
	c)	Explain in brief: [4]
		i) Magnetic induction (B)
		ii) Magnetic permeability (μ)
Q 8)	a)	Explain with a suitable diagram, how ultrasonic testing technique is used for flow defection. [6]
	b)	What is Non Destructive Testing (NDT)? Write advantages of Non Destructive Testing over destructive testing (any four). [5]
	c) (Explain applications of nanotechnology in medicine (targeted drug delivery). [4]
Q9)	a)	Explain optical and electrical properties of nano particles. [6]
	b)	What is nanotechnology? Explain why properties of nanoparticles are different than corresponding bulk materials. [5]
	c)	A block of metal has a thickness of 0.5 cm. An ultrasonic pulse of velocity 5000 m/s is sent through the top of the block. After what time echo would be received from the bottom of the block. At some other location in the block. Echo is received from. Flow after 1.5 µs. Calculate location of the flow. [4]
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くつ		of the flow.

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