

**G.PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY (AT)**

**I.B.Tech, I MID Subjective Examination**

**BRANCH:ECE**

**Sub: Engineering Physics (15A56101)**

**Date: 11-05-2017**

**Time: 1 ½ h**

**SET NO: 1**

**Max.Marks:30**

**PART-A(2x5=10marks)**

**(Answer all the Questions)**

S.NO	QUESTIONS	MARKS	UNIT	CO	COGNITIVE LEVEL
1.	a What is matter wave? Derive the equation for de-Broglie wavelength?	2	III	102.3	Understand and apply
	b What is the basic assumption classical free electron theory?	2	III	102.4	Understand
	c Draw the Fermi level in intrinsic semi conductors at 0 k.	2	IV	102.5	Analyze
	d Interpret the effect of temperature on normal conductor and super conductor graphically?	2	V	102.6	Apply
	e What are Quantum dots?	2	V	102.6	Apply

**PART-B(10x2=20M)**

**(Answer all the Questions)**

2. a) Derive time independent Schrodinger's wave equation for a free particle. Explain the physical significance of wave function.

MARKS :10M	UNIT:III	CO:102.3	COGNITIVE LEVEL: Apply
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(OR)

3. a) Explain Fermi Dirac distribution function. How does it vary with temperature?

MARKS :7M	UNIT:III	CO:102.4	COGNITIVE LEVEL: Understand
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b) Find the temperature at which there is 1% probability that a state with energy 2eV is occupied. Given that Fermi energy is 1.5eV?

MARKS :3M	UNIT:III	CO:102.4	COGNITIVE LEVEL: Apply
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4. a) What are the sources of permanent magnetic moment in magnetic materials.

MARKS :5M	UNIT:IV	CO:102.5	COGNITIVE LEVEL: Understand
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b) Write in detail BCS Theory of Superconductivity?

MARKS :5M	UNIT:V	CO:102.6	COGNITIVE LEVEL: Understand
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(OR)

5. a) Explain the Hall effect and derive an expression for hall coefficient .

MARKS :5M	UNIT:IV	CO:102.5	COGNITIVE LEVEL: Understand and apply
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b) why the properties of materials change at nano scale?

MARKS :5M	UNIT:V	CO:102.6	COGNITIVE LEVEL: Apply
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**SET NO: 2**

**Max.Marks:30**

**PART-A(2x5=10marks)**

**(Answer all the Questions)**

S.NO	QUESTIONS	MARKS	UNIT	CO	COGNITIVE LEVEL
1.	a Show that the wave length of an electron of mass 'm' and kinetic energy 'E' is given by $\lambda = \frac{h}{\sqrt{2mE}}$ .	2	III	102.3	Apply
	b What is the basic assumption Quantum free electron theory?	2	III	102.4	Understand
	c Draw the Fermi level in N type semi conductors at 0 k.	2	IV	102.5	Analyze
	d Define magnetic susceptibility, permeability and obtain a relation between them.	2	V	102.5	Understand
	e Define ac and dc Josephson effect?	2	V	102.6	Understand

**PART-B(10x2=20M)**

**(Answer all the Questions)**

2. a) Show that the energies of an electron confined in a one dimensional potential well of length L and infinite depth is quantized.

MARKS :7M	UNIT:III	CO:102.3	COGNITIVE LEVEL: Apply
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- b) An electron is bound in one-dimensional box of size  $4 \times 10^{-10}$  m. What will be its minimum energy?

MARKS :3M	UNIT:III	CO:102.3	COGNITIVE LEVEL: Apply
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**(OR)**

3. Discuss the formation of allowed and forbidden energy bands on the basis of the Kronig-Penney model.

MARKS :10M	UNIT:III	CO:102.4	COGNITIVE LEVEL: Understand
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4. a) Distinguish between hard and soft magnetic materials based on hysteresis loop area?

MARKS :4M	UNIT:IV	CO:102.5	COGNITIVE LEVEL: Analyze
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- b) What are cooper pairs? Explain how cooper pairs increase the conductivity of superconductor?

MARKS :6M	UNIT:V	CO:102.6	COGNITIVE LEVEL: Understand
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**(OR)**

5. a) What is Hall effect? How does this effect show whether holes or electrons predominate in a superconductor?

MARKS :5M	UNIT:IV	CO:102.5	COGNITIVE LEVEL: Understand
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- b) Explain Sol-gel synthesis for producing nano materials with the help of a neat sketch.

MARKS :5M	UNIT:V	CO:102.6	COGNITIVE LEVEL: Understand
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**Time: 1 ½ h**

**SET NO: 3**

**Max.Marks:30**

**PART-A(2x5=10marks)**

**(Answer all the Questions)**

S.NO	QUESTIONS	MARKS	UNIT	CO	COGNITIVE LEVEL
1.	a Show that the wave length of an electron accelerated by a potential difference 'V' volts, is $\lambda = \frac{12.27}{\sqrt{V}} \times 10^{-10}$ m for non-relativistic case.	2	III	102.3	Apply
	b What are the drawbacks of classical free electron theory?	2	III	102.4	Understand
	c Explain drift and diffusion currents.	2	IV	102.5	Apply
	d Explain Meissner effect.	2	V	102.6	Understand
	e What is meant by top-down and bottom-up approaches?	2	V	102.6	Apply

**PART-B(10x2=20M)**

**(Answer all the Questions)**

2. a) Derive time dependent Schrodinger's wave equation for a free particle. Explain the physical significance of wave function.

MARKS :10M	UNIT:III	CO:102.3	COGNITIVE LEVEL: Apply
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**(OR)**

3. a) Explain the origin of energy bands in solids. Distinguish between metals, semiconductors and insulators based on the band theory of solids.

MARKS :7M	UNIT:III	CO:102.4	COGNITIVE LEVEL: Understand
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- b) Calculate the probability of the electrons occupying an energy level 0.02ev above the Fermi level at 200 K in a metal.

MARKS :3M	UNIT:III	CO:102.4	COGNITIVE LEVEL: Apply
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4. a) Distinguish between dia, para and ferromagnetic materials..

MARKS :4M	UNIT:IV	CO:102.5	COGNITIVE LEVEL: Analyze
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- b) Discuss the formation of the cooper pairs and the existence of energy gap in super conductors based on the BCS theory.

MARKS :6M	UNIT:V	CO:102.6	COGNITIVE LEVEL: Understand
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**(OR)**

5. a) State Hall effect and explain an experiment for the determination of Hall voltage. Mention its applications.

MARKS :6M	UNIT:IV	CO:102.5	COGNITIVE LEVEL:Understand & apply
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- b) What are the basic principles of nanomaterials.

MARKS :4M	UNIT:V	CO:102.6	COGNITIVE LEVEL: Understand
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Date: 11-05-2017

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SET NO:4

Max.Marks:30

**PART-A(2x5=10marks)**

**(Answer all the Questions)**

S.NO	QUESTIONS	MARKS	UNIT	CO	COGNITIVE LEVEL
1.	a Draw the nature of a wavefunction of particle in a potential well at ground and first excited state.	2	III	102.3	Analyze
	b Explain Fermi energy level and Fermi energy.	2	III	102.4	Understand
	c What is Hall effect and mention any two applications of it.	2	IV	102.5	Apply
	d What is Bohr Magneton. Derive its value	2	V	102.5	Understand
	e Why are the properties of nanoscale objects different than those of the same materials at the bulk scale.	2	V	102.6	Apply

**PART-B(10x2=20M)**

**(Answer all the Questions)**

2. a) Show that the energies of an electron confined in a one dimensional potential well of length L and infinite depth is quantized.

MARKS :7M	UNIT:III	CO:102.3	COGNITIVE LEVEL: Apply
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- b) Calculate the wavelength associated with an electron with energy 2000eV.

MARKS :3M	UNIT:III	CO:102.3	COGNITIVE LEVEL: Apply
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**(OR)**

3. a) Obtain an expression for electrical conductivity based on the assumptions of classical free electron theory..

MARKS :7M	UNIT:III	CO:102.4	COGNITIVE LEVEL: Apply
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- b) Using the Fermi function, evaluate the temperature at which there is 1% probability that an electron in a solid will have energy 0.5eV above  $E_F$  of 5eV.

MARKS :3M	UNIT:III	CO:102.4	COGNITIVE LEVEL: Apply
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4. a) What is hysteresis curve? Explain it in detail.

MARKS :4M	UNIT:IV	CO:102.5	COGNITIVE LEVEL: Understand
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- b) Explain Meissner Effect. Discuss type-I and type-II superconductors.

MARKS :6M	UNIT:IV	CO:102.6	COGNITIVE LEVEL: Understand
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**(OR)**

5. a) Explain drift and diffusion currents and derive Einstein's relation.

MARKS :6M	UNIT:II	CO:102.5	COGNITIVE LEVEL: Understand & apply
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- b) Explain the physical properties of nanomaterials..

MARKS :4M	UNIT:II	CO:102.6	COGNITIVE LEVEL: Understand
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