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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)**B.Tech I Year I Semester Supplementary Examinations Nov/Dec 2019****PHYSICS****(Electrical & Electronics Engineering)**

Time: 3 hours

Max. Marks: 60

**PART-A**

(Answer all the Questions 5 x 2 = 10 Marks)

- |   |   |   |    |
|---|---|---|----|
| 1 | a | Define Q-factor.                            | 2M |
|   | b | Abbreviate LASER and MASER.                 | 2M |
|   | c | What is Heisenberg's uncertainty principle? | 2M |
|   | d | What is doping?                             | 2M |
|   | e | Write any two properties of nanomaterials.  | 2M |

**PART-B**

(Answer all Five Units 5 x 10 = 50 Marks)

**UNIT-I**

- |   |   |  |    |
|---|---|--|----|
| 2 | a | What are forced oscillations? Obtain an expression for the amplitude of forced oscillator and give the condition for amplitude resonance.                        | 6M |
|   | b | The amplitude of an oscillator of frequency 200 Hz falls to 1/10 of its initial value after 2000 cycles. Calculate (i) its relaxation time (ii) damping constant | 4M |

**OR**

- |   |   |   |    |
|---|---|---|----|
| 3 | a | Explain detailed mechanism & solution of equation in electrical oscillator.   | 7M |
|   | b | A capacitor of 3 $\mu$ F is discharged through 1-ohm resistance and 3-henry inductance. Calculate the frequency of oscillation. | 3M |

**UNIT-II**

- |   |   |   |    |
|---|---|---|----|
| 4 | a | Explain population inversion.           | 5M |
|   | b | Explain the various pumping mechanisms. | 5M |

**OR**

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|---|---|---|----|
| 5 | a | Explain the construction and working of Nd: YAG laser with suitable energy level diagram. | 8M |
|   | b | What are the advantages of Nd: YAG laser?   | 2M |

**UNIT-III**

- |   |   |  |    |
|---|---|--|----|
| 6 | a | Describe the behavior of particle in a one-dimensional infinite potential well in terms of Eigen values and function.  | 7M |
|   | b | An electron is confined to a one-dimensional potential box of 2 $\text{\AA}$ length. Calculate the energies corresponding to the second and fourth quantum states in eV. | 3M |

**OR**

- |   |   |   |    |
|---|---|---|----|
| 7 | a | Determine the relation between Wavelength & Potential field of a particle by using de Broglie's hypothesis. | 6M |
|   | b | Calculate the velocity and kinetic energy of an electron of wavelength of $1.66 \times 10^{-10}$ m.         | 4M |

**UNIT-IV**

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|---|---|---|----|
| 8 | a | Explain quantum free electron theory.                     | 6M |
|   | b | Write its advantages over classical free electron theory. | 4M |

**OR**

- |   |   |  |    |
|---|---|--|----|
| 9 | a | Describe the Hall effect in a semiconductor. | 7M |
|   | b | Write the applications of Hall effect.       | 3M |

**UNIT-V**

- 10**    **a** Explain Sol-Gel technique for synthesis of nanomaterial. **7M**  
      **b** Write advantages of sol-gel process. **3M**
- OR**
- 11**    **a** What are carbon nanotubes? Explain its structures and types. **8M**  
      **b** Explain the sensor applications of carbon nanotubes. **2M**

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