11621

B.Sc. VI Semester Degree Examination, May - 2018

PHYSICS

Statistical Physic & Solidstate Physics

Paper - 6.1

Time : 3 Hours | Maximum Marks : 80

Instructions to Candidates:

1) Section - I is **compulsory.**

2) Answer any **four** questions each from **section - II** and **Section - III**

SECTION - I

1. Answer any **Twelve** of the following : **(12×1=12)**

A) Choose the correct answer

i) Total number of macrostate for n - 1 particle.

a) n+1 b) n

c) $n-\frac{1}{2}$ d) 2n+1

ii) One light year equal to

a) 9.5×10^{12} km b) 9.5×10^{11} km

c) 9.5×10^{13} km d) None of the these

iii) The co-ordination number for fcc lattice is

a) 6 b) 8

c) 12 d) 14

iv) The super conductor is perfect

a) Paramagnetic b) Diamagnetic

c) Ferromagnetic d) None of these

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B) Fill in the blanks

i) Bose Einstein statistics is applicable to .....

ii) P - type semiconductor is obtained by doping ..... group element in to intrinsic semiconductor.

iii) Number of atom per unit cell is 2 for .....

iv) The susceptibility of paramagnetic substance is ..... proportional to temperature.

C) State True or False

i) Orion is an example for bright nebulae.

ii) Holes are not found in valance band.

iii) The susceptibility of diamagnetic is negative.

D) Answer the following in **one** or **two** sentences.

i) Define absolute magnitude of star

ii) State Dulong and petits law

iii) Define drift velocity of electron in metal.

iv) What is meant by persistent current.

SECTION - II

2. Define Engemble, canonical ensemble Grand canonical ensemble & microcanonical ensemble.

3. Define apparent magnitude of star and hence derive $m - M = 5\log d - 5$.

4. What do you understand by Miller Indices of crystal plane. Mention its importance.

5. Explain Ionicbonding and covalent bonding.

6. Write any four differences between diamagnetic & ferromagnetic materials.

7. Write any four applications of superconductor. **(16)**

SECTION- III

8. a) What are the assumption made by Bose Einstein statistics. Derive an expression for

energy distribution in Bose Einstein statistics. **(9)**

b) How does MB statistics differ from FD statistics. **(4)**

9. a) What do you mean by Heartz sprung - Russel diagram. Explain it. **(9)**

b) P - star is at a distance of 11.82 light year and has a brightness of 6.70×10^{-10} w/m^2. Calculate its Luminosity. **(4)**

10. a) Derive an expression for number of electron per unit volume in an intrinsic semiconductor. **(9)**

b) Derive an expression for Hall coefficient in terms of Hall voltage. **(4)**

11. a) Derive Bragg's relation $2d\sin\theta = n\lambda$ Describe working of Bragg's spectrometer. **(9)**

b) Calculate interplanar specing for (322) plane in a simple cubic lattice where lattice constant is 4×10^{-10}m. **(4)**

12. a) Derive an expression for electrical and thermal conductivity in a metal. **(9)**

b) Write any four differences between diamagnetic and paramagnetic material. **(4)**

13. a) Explain quantum theory of ferromagnetism and hence derive Curie weiss law. **(9)**

b) The superconducting material has a critical temperature 2.7 k at zero magnetic field and a critical field of 0.0.030 tessla at 0K. Find the critical field at 3K. **(4)**

11622

B.Sc. VI Semester Degree Examination,May - 2018

PHYSICS

Network Theorems Optoelectronics and Electronics

Paper - 6.2

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

1) Section - I is **compulsory.**

2) Answer any **four** questions each from **section - II** and from **Section - III**

Section - I

1. Answer any **Twelve** of the following : **(12×1=12)**

A) Choose the correct answer

i) Decimal equivalent of binary number 11011_2 is

a) 23 b) 25

c) 27 d) 29

ii) In a transistor with normal bias the emitter base junction.

a) has low resistance b) is reversebias

c) has high resistance d) is not biased

iii) Positive feedback is used in

a) Rectifier b) oscillator

c) Amplifier d) Detector

iv) The value of noise in AM when compared to FM is

a) Zero b) Less

c) More d) None of these

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B) Fill in the blanks

i) The propagation of light through a fibre core depends on the phenomenon of ..... internal reflection.

ii) In an AM wave the band width is ..... the signal frequency.

iii) A transistor has ..... depletion layer.

iv) A LED is basically a ..... PN Junction.

C) State True or False

i) $\propto$ of a transistor is always greater than β.

ii) An oscillator circuit must satisfy Barkhausen criterion.

iii) Modulation is done in transmitter.

D) Answer the following in **One** or **Two** sentences.

i) Which gates are called universal gates?

ii) Define operational point.

iii) Mention one application of operating amplifier.

iv) Define Modulation factor.

Section - II

(4×4=16)

2. State and prove maximum power transfer theorem.

3. Explain the construction and working of AND gate using diodes.

4. What is load line? Explain how it is obtained.

5. Mention the characteristics of an operational amplifier and write down the applications of an operational amplifier.

6. Write a note on amplitude modulation with necessary figures.

7. Give the construction and working of LCD.

Section - III

8. a) State Thevenin's theorem. Explain how to Thevenise the circuit. **(5)**

b) Obtain an expression for numerical aperature of an optical fibre. What is meant by an acceptance angle. **(4)**

c) Calculate the numerical aperature and hence the acceptance angle for an optical fibre whose core and cladding has refractive indices of 1.59 and 1.40 respectively. **(4)**

9. a) Explain the working of Half adder and Full adder. **(9)**

b) How do you convert NAND gate into basic gates. **(4)**

10. a) Describe the construction and working of function field effect transistor. Draw the drain and transfer characteristics and circuit diagram for n - chhanel FET. **(9)**

b) In a transistor the base current and collector current are 80 μA and 1.85 mA respectively. Calculate α and β of the transistor. What will be the emitter current. **(4)**

11. a) Draw the h parameter model for a transistor in CE configuration. Derive the expressions for the voltage gain, current gain, input and output impedance, power gain. **(9)**

b) A transistor used in CE arrangement has the following h - parameters $h_{fe} = 38$ and $H_{oe}=6\times10^{-6}$ ℧ $R_L=2k\Omega$. Determine its current gain. **(4)**

12. a) Explain the working of a phase shift oscillator with a neat circuit diagram. **(9)**

b) A wein bridge oscillator is used for operation has $C_1 = 250$ PF, $C_2 = 300$ PF. If the value of $R_1=200k\Omega$ $R_2=250k\Omega$ find the value of the frequency of oscillation. **(4)**

13. a) Explain with a neat diagram the working of a superheterodyne AM receiver. **(9)**

b) The maximum peak to peak voltage of an AM wave is 16 mV and the minimum peak to peak voltage is 4 mV. Calculate modulation factor. **(4)**
