KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018

Marks Scored:

Level: B. E.
Year : II

Course : EEEG 207
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : MAR 0 7 2018

SECTION "A"
[20 Q. × 0.5 =10 marks]

Choose the most appropriate option

1. Effective number of lattice points per unit body centered cubic cell is _____.
   a. 1 b. 2 c. 3 d. 4

2. The material used in core of fast breeder reactor is _____.
   a. U-235 b. U-236 c. U-237 d. U-238

3. The probability of finding electron above Fermi-energy at absolute zero is given by____.
   a. 0.3% b. 0.2% c. 1% d. 0%

4. If σ , τ ,q, m, n represent the conductivity, relaxation time, electron charge, mass of electron and number of electron, respectively, which of the following expression correctly relates the conductivity and relaxation time in metal?
   a. $\sigma = \frac{\tau q^2}{nm}$ b. $\sigma = \frac{nq^2}{\tau m}$ c. $\sigma = \frac{n\tau q^2}{m}$ d. $\sigma\sigma$ = $\frac{n\tau}{mq^2}$

5. If n_e and n_h represent the number of electron and number of hole, respectively, which of the following is true for intrinsic semiconductor?
   a. $n_e = 4n_h$ b. $n_e = 3n_h$ c. $n_e = 2n_h$ d. $n_e = n_h$

6. Assuming the number of electron per meter cube is $5x10^{12}$, the position of Fermi level at room temperature (27^0c) for a germanium crystal is _____.
   a. 0.36 eV b. 0.1 eV c. 0.56 eV d. 0.75 eV

7. Meisner effect can be observed in _____.
   a. Insulators b. Conductors c. Semiconductors d. Super conductors

8. What is the diffusion length if carrier life time is 10μs and diffusion coefficient is 27 $\frac{cm^2}{s}$?
   a. 0.016 cm b. 0.36 cm c. 0.046 cm d. 0.08 cm

9. The following figure is the symbol of _____.

   a. Light emitting diode b. Laser diode
   c. Tunnel diode d. Varactor diode

10. The material used for metallization in IC fabrication process is _____.
a. Silicon b. Germanium c. Arsenic d. Aluminum

11. If ε and ε_0 denote the permittivity of material and permittivity of free space, which of the following correctly represents the expression for dielectric constant (K)?
a. $K = \varepsilon / \varepsilon_0$ b. $K = \varepsilon \varepsilon_0$ c. $K = \varepsilon_0 / \varepsilon$ d. $K = \varepsilon^2 / \varepsilon_0$

12. Work function of Tungsten is given by _____.
a. 0.5 b. 2.5 eV c. 4.5 eV d. 6.5 eV

13. SIO_2 layer is grown over silicon substrate in IC fabrication process for _____
a. Metallization b. Diffusion c. Conductivity d. Isolation

14. Tunnel diode is _____biased and varactor diode is _____ biased respectively.
a. Forward, reverse b. Reverse, forward
c. Reverse, reverse d. Forward, forward

15. To operate properly, a transistor's base-emitter junction must be forward biased with reverse bias applied to _____ junction.
a. Collector- base b. Collector- emitter c. Emitter - collector d. Base- emitter

16. Which of the following type of dielectric polarization occur at $10^{13} - 10^{15}$ Hz frequency range?
a. Electronic polarization b. Ionic polarization
c. Orientational polarization d. Interfacial polarization

17. In photodiode, when there is no incident light, reverse current is almost negligible and is called _____.
a. Photocurrent b. Zener current c. PIN Current d. Dark current

18. Which action plays a significant role in enhancing the conductivity of channel by inducing the free electrons especially in enhancement mode of N-channel MOSFET?
a. Inductor action b. Capacitor action c. Resistive action d. Filter action

19. If E represents the energy level, the density of states in copper is directly related to _____.
a. E^2 b. E c. E^3 d. $E^{0.5}$

20. A paramagnetic material has a magnetic field intensity of 10^4 Am^{-1}. If the susceptibility of the material at room temperature is 3.7×10^{-5}, the magnetization in the material is _____.
a. 7 Am^{-1} b. 17 Am^{-1} c. 27 Am^{-1} d. 37 Am^{-1}

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018

Level : B. E.
Year : II
Time : 2 hrs. 30 mins.

Course : EEEG 207
Semester : I
F. M. : 40

SECTION "B"

[4 Q × 10 = 40 marks]

Attempt *ANY FOUR* questions. Figure in the margin indicates the full mark. **Symbols have their usual meaning.** Students are required to answer in their own words as far as practicable.

1. a. How is fast breeder reactor different form the conventional nuclear reactor? Describe the working of fast breeder reactor with the help of diagram. [6]
   b. Find the mobility of holes at 300 k for diffusion coefficient equal to 1 cm^2/s. Use Einstein relation for calculation. [2]
   c. Differentiate between the phototransistor and the photodiode. [2]

2. a. Obtain an expression that locates the Fermi energy in n type semiconductor. Find the expression in terms of energy gap of the material. [6]
   b. How are super conductors classified? Explain each type of superconductors and mention the applications of such superconductors. [4]

3. a. Why does dielectric loss occur in dielectric material? Explain. [2]
   b. Derive an expression for Hall voltage and explain the application areas of Hall effect. [5]
   c. Describe the thermionic emission and work function. Also, differentiate between the thermionic emission and photoelectric emission. [3]

4. a. Classify the cubic unit cell of a crystal and obtain the packing efficiency of face centered cubic unit cell. [5]
   b. Derive the expression for time dependent form of Schrodinger equation. Make appropriate assumptions if necessary. [5]

5. a. Write general steps for IC fabrication and explain the photolithography process in detail. [5]
   b. Write short notes on: [2 × 2.5]
      (i) Varactor diode
      (ii) Piezoelectricity