

[This question paper contains 2 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 9268

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Unique Paper Code : 2223012004

Name of the Paper : Physics of Devices

Name of the Course : B.Sc. Hons. (Physics) NEP UGCF-2022

Semester : IV – (DSE Paper)

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **FOUR** questions in all.
3. **All** questions carry equal marks.
4. Question No. 1 is compulsory.
5. Scientific (non-programmable) calculators are allowed.

1. Answer any **five** of the following questions : (5×3=15)
 - (a) The energy gap of the semiconducting material of an LED is 1.37eV. What is the wavelength of the emitted light?
 - (b) Draw the block diagram of DIAC and its IV characteristic curves.
 - (c) Calculate the gain of passive R-C low pass filter at 1 kHz and at 2 kHz frequencies of input signal for $R = 10 \text{ k}\Omega$ and $C = 0.01 \text{ }\mu\text{F}$.
 - (d) Draw the IV characteristics of (i) Ohmic and (ii) Schottky Junctions.
 - (e) Describe in brief SSI, MSI, LSI and VLSI.
 - (f) What is the basic difference between the Enhancement and Depletion modes in MOSFET?

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2. (a) For an unbiased p - n junction, sketch the variation of space charge, electric field and potential as a function of distance across the junction. Derive the expression for the depletion layer width and barrier potential. (10)
- (b) Draw the energy band diagram of a Metal-Semiconductor (n-type) junction with $\phi_m > \phi_s$ under the thermal equilibrium condition. (5)
3. (a) Draw its equivalent circuit and explain the IV characteristics of UJT. Explain the application of UJT as relaxation oscillator and obtain an expression for the charging time of the saw tooth waveform generated at the output. (10)
- (b) A JFET has the following parameters: $I_{DSS} = 32 \text{ mA}$; $V_{GS}(\text{off}) = -8\text{V}$; $V_{GS} = -4.5 \text{ V}$. Find the value of drain current. (5)
4. (a) Draw the circuit diagram and frequency response of the active first order high pass butterworth filter. Obtain an expression for the low cutoff frequency and gain of the filter. (10)
- (b) A band-pass filter has a bandwidth of 500 Hz and center frequency of 1650 Hz. Find the quality factor of the filter. Explain if it is a wide band pass or narrow band pass filter and why? (5)
5. (a) What is a Photo-resist and what are its different types? Explain the processes of Photolithography with the help of suitable diagrams using both type of photoresists separately. (10)
- (b) What is electron lithography? Explain why it is better compared to photolithography. (5)