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[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 8094 J

Unique Paper Code : 32227505

Name of the Paper : Physics of Devices and Communications

Name of the Course : **B.Sc. (H) Physics : DSE-2**

Semester : V

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **five** questions in all.
3. Question No. **1** is compulsory.
4. **All** questions carry equal marks.

1. Attempt any **five** questions of the following : (5×3)

   (a) Draw the equivalent circuit of UJT.

   (b) Draw the energy band diagram of a metal semiconductor (p or n type) junction.

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(c) Differentiate between wet and dry etching.

(d) What is short circuit protection in a power supply?

(e) Write down the advantages of active filters over passive filters.

(f) Draw the pin out diagram of a PLL IC 565.

(g) Define handshaking in serial communication.

(h) The total power of amplitude modulated wave is 900 watts. Calculate the power of unmodulated carrier wave at 100% modulation.

2. (a) Explain with appropriate diagrams the drain and transfer characteristics of metal oxide semiconductor field effect transistor (MOSFET). (9)

(b) What is flat band voltage in MOS device? (3)

(c) The ac drain resistance and amplification factor of a FET are 200 kΩ and 20 respectively. Calculate the transconductance of FET. (3)

3. (a) Briefly discuss the growth of oxide layer on silicon wafer. (5)

(b) Differentiate between positive and negative photoresists. (5)

(c) What is electron beam lithography? Why is electron beam lithography preferred over photolithography? (5)

4. (a) Justify the need of modulation in communication. Draw the circuit diagram of AM modulator and explain its working. (9)

(b) Define pulse modulation. Sketch the waveforms of message signal, pulse amplitude and pulse width modulated waves. (6)

5. (a) Obtain the expression for the gain of an active high pass filter. (6)

(b) Explain the working of a XOR based phase detector. (6)

(c) Determine the pinch off voltage for n-channel Si JFET having channel width of 5.6 μm and donor concentration of 10^{15} cm^{-3} (dielectric constant of Si is 12). (3)

6. (a) Explain the working of an astable multivibrator using transistors. (9)

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(b) What is an envelope detector? Explain its working with the help of suitable waveforms. (6)

7. Write short notes on any **two** of the following :

(a) Shunt transistor regulator

(b) Charged coupled device (CCD)

(c) Amplitude shift keying and frequency shift keying (7.5×2=15)

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