(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0321 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. III) ODD SEMESTER THEORY EXAMINATION 2010-11

ANALOG AND DIGITAL ELECTRONICS

Time : 3 Hours *Total Marks : 100*

Note : Attempt **all** questions. All questions carry equal marks.

1. Attempt any **four** parts of the following : **(5×4=20)**

   (a) Explain the operation of a LED with the help of necessary diagrams. List the materials used for constructing LED. Give the advantages and disadvantages of LED.

   (b) Explain the forward and reverse characteristics of a Tunnel diode and explain the tunneling operation.

   (c) Explain the characteristics of a varactor diode and mention how it can be used in a resonant circuit. Also list some of the applications of the varactor diode.

   (d) Explain the construction, operation and I-V characteristics of a Schottky diode. Also give its equivalent circuit diagram and circuit symbol.

   (e) With the help of a neatly labeled circuit diagram explain the switching operation of a transistor. Also give the switching waveforms.

(f) Define and explain the following terms in case of a photo detector :

(i) Responsivity

(ii) Quantum Efficiency

(iii) Directivity

(iv) Dark Current.

2. Attempt any two parts of the following : **(10×2=20)**

(a) Why h-parameters could not be used for high frequency analysis of the transistors ? Give the hybrid-π equivalent circuit of a Bipolar Junction Transistor, explaining the significance of the terms appearing in the circuit. Define the following — f_α, f_β and f_T and derive the relationship between f_α and f_β.

(b) Give the high frequency small-signal circuit of a MOSFET with load resistance showing the effect of Miller capacitance. Also derive an expression for the Miller Capacitance and cut-off frequency (f_T).

(c) What are the general properties of Negative feedback ? And explain how negative feedbacks can be used for input resistance, output resistance, and bandwidth stability.

3. Attempt any two parts of the following : **(10×2=20)**

(a) Explain the Barkhausen criteria for oscillators. And also derive the necessary conditions required for oscillations. What are the factors on the basis of which oscillators are classified ?

(b) Design an RC phase shift oscillators using BJT for a frequency of 1 kHz. The stability factor $S \leq 8$. Given that $V_{CC} = 10$ V. The transistor has h-parameters as follows — $h_{ie} = 1k\Omega$, $h_{fe} = 50$, $h_{re} = h_{oe} = 0$.

(c) Explain the operation of a Wien-Bridge oscillator and derive the necessary condition for oscillation. Give the equivalent circuit of a crystal and give the advantages of a crystal oscillator.

4. Attempt any **four** parts of the following : **(5×4=20)**

(a) Define combinational circuit. Realize the following expression $f(A, B, C) = \Sigma m (0, 2, 4, 6)$ using a 4 : 1 multiplexer.

(b) Explain the difference between Latch and Flip-Flop. Explain how a D Flip-Flop is obtained from a JK Flip-Flop.

(c) Design a 3-bit Bi-Directional Shift resistor using JK Flip-Flop.

(d) What is a universal shift register ? Explain its operation with the help of a logic diagram showing all the necessary signals.

(e) Differentiate between synchronous and asynchronous counter. Give the logic diagram of a BCD counter.

(f) Explain the operation of a Johnson counter using D Flip-Flop.

5. Attempt any **four** parts of the following : **(5×4=20)**

(a) Give the circuit diagram of a Non-inverting Schmitt Trigger and derive the expression for Hystersis voltage.

(b) Explain the operation of a Astable Multivibrator circuit using an Op-Amp. Also derive the expression for cut off frequency.

(c) Give the functional block diagram of timer IC 555 and explain how it can be used to obtain a Monostable Multivibrator.

(d) Distinguish between A/D and D/A converters. Explain the operation of any one of them.

(e) Give the circuit diagram of a sample and hold circuit and explain its operation.

(f) Explain the procedure for obtaining a 32×4 memory using 16×4 memory chips. Also show the necessary circuit diagram.