Achhruram Memorial College

Affiliated to Sidho Kanho Birsha University

Electronics Examination
Question – 3

Date: 13-11-2017
Time: 10:30AM – 12.30PM
Full Marks: 50

All Questions are compulsory:

(1) How can drain current in a MOSFET be enhanced by a negative gate voltage?   2

(2) Draw the logic circuit diagram of Boolean expression $(\bar{A}+B)A\bar{B}=Y$ 2

(3) How do the characterizations of a practical OP-AMP differ from those of ideal OP-AMP?   2

(4) Show that an amplifier having an input (v_1)-Output (V_o), the characteristic given as, $v_o = a_1v_1 + a_2v_i^2$, where a1 and a2 are constants, can be used to design an amplitude modulator.   2

(4) What is Karnaugh Map representation? Find the Karnaugh Map representation of following equation : $Y= ABCD+\bar{A}BCD+A\bar{B}CD+\bar{AB}CD$ 2

(5) What is the Barkhausen criterion for a feedback amplifier to function as an oscillator? With the help of a circuit diagram, explain the operation of a phase shift oscillator and find its frequency of oscillation.   1+4

(6) What is a tunnel diode? Explain the I-V characteristics of tunnel diode. What is the significance of the negative resistance shown by the diode?   1+2+2

(7) What is an R-S flip-flop? Give its logic symbol, truth table, and circuit realization using NOR/NAND gates. How R-S flip-flop can be converted to J-K flip-flop?   1+3+1

(7) What is an MOSFET? What is the main difference between MOSFET and JFET? Determine the output voltage of the JFET amplifier with v_i =1mV and R_D=2.5kΩ. Take g_m = 5mA/V and r_d = 60kΩ (Symbols have usual meaning)   1+2+2

(8) (a) Obtain an expression for the output voltage of a differential amplifier in terms of A_d and A_e (where A_d : differential voltage gain and A_c : Common mode voltage gain).

(b) What is amplitude modulation? Deduce an expression for an amplitude modulated carrier wave. Show that amplitude modulated wave can be represented by a carrier wave and two side band frequencies. Deduce the expression of powers of these three components.

(c) A 5kW carrier wave is amplitude modulated to a modulated index 60%. Find the total power in the amplitude modulated wave.   (2+1)+(1+2+2)+2

(10) (a) Draw a circuit diagram of two stage RC-coupled CE transistor amplifier. Show how the magnitude and the phase angle of its voltage gain vary with frequency. Qualitatively explain these variations. Define the half power frequencies.

(b) If the lower and upper half-power frequencies of an RC coupled amplifier are 30Hz and 300Hz, respectively, find the gain relative to the mid-frequency gain at 60Hz and 600Hz.   (1+4+1+1)+2