2016

PHYSICS

PAPER : PHY 203
ELECTRONICS
(Old Course)

Full Mark : 80
Time : 3 Hrs

Figures in the right hand margin indicate full marks for the question

1. Answer any five questions: $2 \times 5 = 10$

(a) Plot the following Boolean function on a three variable K-map.

$Y = f°m(1,3,5,6)$

(b) Write an expression for frequency stability of phase shift oscillator. What is the total phase of this oscillator?

(c) What are the minimum number of gates generally incorporated in fabricating the LSI and VSLI?

(d) State the role of oxide layer of E-MOSFET

(e) Give the two basic differences between general diode and tunnel diode?

(f) The rms antenna current of an AM radio transmitter is

10A when unmodulated and 12A when sinusoidally modulated. What is modulation index?

2. Answer any four questions: $5 \times 4 = 20$

(a) Discuss with band diagram how negative resistance of Tunnel Diode can be obtained.

(b) (i) A carrier wave of 12V is modulated by a modulating signal of amplitude 6V. Find the ratio P_t/P_c

(ii) Draw the field profiles for TE_{10} mode in a rectangular wave guide.

(c) Discuss with band diagram how negative resistance of Tunnel diode may be obtained? Explain with necessary expressions under what conditions the Tunnel diode circuit becomes (a) non-oscillatory and (b) sinusoidal.

(d) What is roll off rate of a 1st order filter? Design a second order Butterworth low pass filter having cut-off frequency 1.5 kHz.

(e) Using OP-AMP, design a circuit to solve the following equations:

$$\frac{d^2y}{dx^2}+2\frac{dy}{dx}-y=3$$

with its initial conditions: $y(0)=2$ and $\frac{dy}{dx}\Big|_{t=0}=-1$

(f) What is characteristic impedance of a transmission line?

Show that for a low less RF transmission line $Z_0 = \sqrt{L/C}$ where L and C are inductance and capacitance per unit length.

3. Answer any five questions: $10 \times 5 = 50$

(a) Find the voltage and current at any point in a transmission line considering separately an open-circuited line and a short-circuited line from its solution. Prove that, $Z = \sqrt{(Zsc \times Zoc)}$, where Zsc and Zoc are open circuited and short circuited input impedances. 5+5=10

(b) Plot the following Boolean function on K-map and find its reduced function in SOP form. Draw the logic circuit:

$$F = \Sigma m\,(0,3,4,5,5,8,10,12) \qquad 3+3+4=10$$

(c) Draw the basic structure of an n-channel E-MOSFET and explain its operation. What is CMOS? Draw an inverter circuit using MOSFET. 2+4+1+3=10

(i) A rectangular wave guide has a broad wall dimension of 2.275 cm. Determine whether TE_{10} wave will be propagated and if so, find its guide wave length, phase and group velocities. 5

(ii) Establish the following expression for propagation constant of rectangular wave guide (a, and b are dimensions): 5

$$\bar{\gamma} = \sqrt{[\frac{(\pi m)^2}{a^2} + \frac{(\pi n)^2}{b^2}]}$$

(d) (i) What is radiation resistance? "Radiation resistance of a $\lambda/4$ dipole is 73 Ω". What do you understand by the above statement? 4

(ii) Describe about the Horn antenna giving the special emphasis on its dimension for optimum power gain. 6

(e) Define the following terms associated with function of a microprocessor:

(i) Assembling language and Machine language

(ii) Accumulator (iii) SP and PC

Give step by step instructions for processing a job in microprocessor, starting from functioning of I/O port address bus and data bus. 2+2+2+4=10

(f) (i) What is single side band (SSB) modulation and why it is important? Draw a simple circuit of Balance Modulator to separate two side bands. 6

(ii) Draw a block diagram of basic stages in generation of PCM. 4

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