

2017

M.Sc.

1st Semester Examination

PHYSICS

PAPER – PHS-104 (Gr. – A + B)

Full Marks : 50

Time : 2 Hours

(Analog Electronics-I – PHS 104A)

Answer Q1 and any one from Q2 and Q3

1. Answer any five bits: 5X2 = 10
- (a) What do you mean by slew rate of an OP-AMP? What should be its ideal and practical value?
 - (b) An amplitude modulated broadcast radio transmitter radiates at 20KW at modulated index 75%. How much is the carrier power?
 - (c) Explain why the FET is a voltage controlled device whereas BJT is current controlled device.
 - (d) Sketch Block diagram of FM transmitter with automatic frequency control.
 - (e) Define skip distance and maximum usable frequency (MUF) in radio-wave communication.
 - (f) What is Secant law in radio wave communication?
 - (g) Compute the length of a half-wave dipole antenna of frequency 25 MHz.
 - (h) Why E-MOSFET is superior over D-MOSFET?

(Turn Over)

2. (a) Show that for radio-wave propagation through ionosphere $\epsilon = \epsilon_0(1 - \frac{81N}{f^2})$ where ϵ is effective permittivity of ionized region and f is the frequency of the radio-wave. (4)
- (b) Derive radar range equation in free space. (4)
- (c) Explain the operation of CMOS NOR gate with figure. (2)
3. (a) What do you mean by frequency modulation? Write down the expression for FM wave modulated by a sinusoidal signal and find out its spectral components. (1+4)
- (b) Describe the method of generation of DSB-SC signal by using balanced modulator. Draw the corresponding waveforms. (4+1)

(Digital Electronics-I – PHS 104B)

Answer Q1 and any one from Q2 and Q3

1. Answer any five bits: 5X2 = 10
 - (a) Minimize the following expression using K-map: $F = ABC + BC\bar{D} + \bar{A}BC$.
 - (b) How many decade counters required to convert a clock of 1 GHz to 100 Hz?
 - (c) Convert J-K flip-flop into T flip-flop and explain its operation.
 - (d) Design a half subtractor circuit.
 - (e) In a 3-bit digital system the output goes high only when the control bit is high and the rest two bits are in opposite phase. Right down the truth table.

(Continued)

- (f) 2k Hz and 4k Hz signal are applied to an NAND gate. Draw the output waveform?
- (g) Draw the waveforms coming out from different outputs of a MOD-5 counter.
- (h) Calculate the number of flip-flop required to design a MOD-17 and MOD-77 counter.
2. (a) Draw the circuit diagram for astable multivibrator using transistors and explain its operation. (5)
- (b) Simplify the following expression using K –map: $f(A, B, C, D) = \sum m(1, 3, 7, 11, 15) + d(0, 2, 5)$ (3)
- (c) What is a universal shift register? (2)
3. (a) Design a 4-bit synchronous counter and explain its counting operation. (5)
- (b) What do you mean by Universal register? Give the circuit of a 2 bit Universal register and indicate the different mode of action. (5)

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Internal Assessment-10