(b) Design and explain the operation of an astable multivibrator using 555 timer. (4+4)

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Internal Assessment-10

2018

M.Sc.

1st Semester Examination

PHYSICS

PAPER – PHS-104 (Gr. – A + B)

Full Marks : 50

Time : 2 Hours

Use separate answer scripts for Group A and Group B

(Analog Electronics-I – PHS 104A)

Answer Q1, Q2 and any one from Q3 and Q4

1. Answer any two bits: 2X2 = 4

(a) A carrier wave of 500W is subjected to 100% amplitude modulation. Determine power of modulated wave and power in side bands.

(b) Sketch the block diagram of demodulation of AM signal.

(c) Explain why the gain of a practical OP-AMP falls at high frequencies?

(d) Explain qualitatively why an antenna radiates electromagnetic signal.

2. Answer any two bits: 2X4 = 8

(a) Sketch the block diagram of FM transmitter with automatic frequency control and explain the functions of the blocks.

(b) Write notes on skip distance and explain the following: “the strength of the sky wave signal received at night is larger than that received at day for the same transmitter power”.

(Turn Over)

(c) Derive the expression for the radiation resistance of a half-wave antenna.

(d) What are the advantages of a n-channel MOSFETs over p-channel MOSFETs? Find the collector current of the silicon transistor of DC current gain 100 from the figure

3. (a) Show that the phase velocity of a plane electromagnetic wave propagating in an ionized medium is greater than the velocity of light in free space. (4)

(b) Define the critical frequency of an ionospheric layer. Show that the critical frequency f_c is related to the peak electron concentration N_p of the reflecting layer by $f_c = 9\sqrt{N_p}$. (2+2)

4. (a) Show that total power for a fully amplitude-modulated wave is 1.5 times the unmodulated carrier power. Calculate the power developed by an AM wave in a load of 100Ω when the peak voltage of the carrier is 100 volt and the modulation factor is 0.4. (3+2)

(b) What is CMRR? Discuss the architecture of an IC OP-AMP with block diagram. (1+2)

(Continued)

(Digital Electronics I– PHS 104B)

Answer Q1, Q2 and any one from Q3 and Q4

1. Answer any two bits: 2X2 = 4

(a) Simplify the following expression using K –map:

$$f(A,B,C,D) = \sum m\,(0,1,4,5,10,11) + d(13,14,15)$$

(b) Design the circuit for the Boolean expression: $Y = ABC + \bar{A}B$

(c) What is monostable multivibrator? Give example.

(d) In a 4-bit asynchronous counter the progression delay of each Flip-Flop is 4 ns. Find out the maximum clock frequency that can be used for that counter. What will be the frequency of the MSB of the counter at that clock signal?

2. Answer any two bits: 2X4 = 8

(a) Design a 4-bit parallel in-serial out register. Explain the operation.

(b) Design and explain the operation of mod-11 counter.

(c) What do you mean by astable, monostable and bistable multivibrators? Give examples.

(d) Write the truth table of even parity generator of 4-bit signal with necessary circuit diagram.

3. (a) Design asynchronous 3 bit up-down counter and explain its operation.

(b) Explain the operation of S-R flip-flop and write the state diagram. (4+4)

4. (a) What is race around condition in JK flip-flop and how it was removed?

(Turn Over)