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PG CBCS
M.Sc. Semester-I Examination, 2022
PHYSICS
PAPER: PHS 104
(ANALOG ELECTRONICS – I & DIGITAL ELECTRONICS – I)

Full Marks: 40 **Time: 2 Hours**

Write the answer for each unit in separate sheet

UNIT- PHS 104.1
ANALOG ELECTRONICS – I

GROUP-A

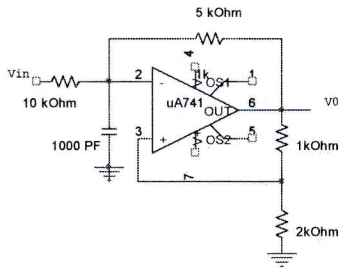
1. Answer any TWO from the following questions: **2×2=4**

a) Why modulation is used in communication techniques?
b) Explain the term "skip distance" in radio wave communication.
c) What is the length of dipole antenna?
d) Draw the circuit diagram of input stage of an Op-Amp.

GROUP-B

2. Answer any TWO from the following questions: **2×4=8**

a) Explain the different stage of OP-AMP architecture briefly describing its functions.
b) Find out the output voltage of the given figure below.



c) Find the carrier and modulating frequencies, the modulation index and the maximum deviation of the FM wave represented by the voltage equation

$$V_{FM} = 12\sin(6 \times 10^8 t + 5\sin(1250t))$$

d) Differentiate amplitude modulation and frequency modulation.

GROUP-C

3. Answer any ONE from the following questions: **1×8=8**

a) Describe the principle of generation of F.M wave with necessary circuits. Describe Secant law in radiowave propagation. Derive the electromagnetic field in the far field zone of a dipole antenna.

P.T.O.

b) Discuss the refraction of sky waves by ionosphere. Show that ionosphere behaves like a medium of refractive index $\mu = \sqrt{1 - \frac{81N}{f^2}}$ where N is the electron density of the layer and f is the frequency in Kc/s. Use the above equation find out the critical frequency. What do you mean by maximum usable frequency? 2+4+1+1

UNIT- PHS 104.2
DIGITAL ELECTRONICS – I

GROUP-A

1. Answer any TWO of the following questions: 2×2=4

a) Why we need an active element to build a NOT logic?
b) Draw a clear picture of an IC 555 showing all internal components.
c) Minimize the following expression using K-Map
F(A,B,C,D)=$\sum m(1,4,7,10,13) + \sum d(5,14,15)$
d) Determine the required number of flip flops for MOD -72 and MOD-148 counters.

GROUP-B

2. Answer any TWO of the following questions: 2×4=8

a) Describe the principle of astable multivibrator using clear circuit digram.
b) Convert D-Flip Flop to SR Flip Flop with necessary circuit diagram.
c) Write down the implementation table of a J-K flip-flop and establish the expression of Q_{n+1} in terms of J, K, and Q_n through Karnaugh Map simplfication process.
d) Draw and explain Universal registers?

GROUP-C

3. Answer any ONE of the following questions: 1×8=8

a) How many maximum Boolean variables are allowed in Karnaugh Map simplification process? Simplify the Boolean expression of $F(A,B,C,D) = \sum m(7) + d(10,11,12,13,14,15)$.
Do the following conversion between SOP and POS expression;
$F(A,B,C) = \prod M(0,3,6) = \sum m(?)$ and $F(A,B,C) = \sum m(3,5,6,7) = \prod M(?)$

b) A certain memory has capacity of 8KX16. How many data input and data output lines does it have? How many address lines does it have? What is the capacity in bytes? Draw the special structure of MOS for EPROM. Explain the operation (storing and erasing) of EPROM using this MOS.

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