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**PG CBCS**

**M.SC. Semester-I Examination, 2021**

**DEPARTMENT OF PHYSICS**

PAPER: PHS 104

**(APPLIED ELECTRONICS)**

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

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**Write the answer for each unit in separate sheet**

**PHS 104.1**

**Answer any TWO questions of the following**: **2X10=20**

1. (a)What is the use of OP-AMP in open-loop configurations? Explain inverting and non-inverting comparator (zero reference voltage) with proper circuit diagram and transfer characteristics. (1+4)

   (b) Design a OP-AMP Integrator and derive its output voltage expression in terms of input voltage? What will be the output wave form of the above circuit if we input a square waveform? (4+1)

2. (a) Describe n-MOSFET and p-MOSFET for both enhancement and depletion mode operation using proper schematic and electrical characteristics (5)

   (b) Derive the expression for the radiation resistance of a half wave antenna. (5)

3. (a)What is dipole antenna? Derive the expression of radiation pattern of an half wave antenna? (1+5)

   (b)What is Active Filter? What is the Butterworth response of an active filter? (1+2)

4. (a) Neglecting the effect of earth's magnetic field and the energy loss, show that the refractive index of the ionosphere is given by,

$$n = \sqrt{1 - \frac{80.8N}{f^2}}$$, where N=no. of electrons/cc. f=frequency in kHz (5)

   (b) Why modulation is necessary in communication, explain in details. What is the advantages of FM over AM? (3+2)

5. (a) Derive RADAR range equation and explain how radar range can be increased? (5)

   (b) What is the need of duplexer in a RADAR system? Describe Doppler Radar? (1+4)

## PHS 104.2

**Answer any TWO questions of the following**: **2X10=20**

1. (a)Simplify the boolean expression $F \equiv \overline{A}B\overline{C} + AB\overline{C} + ABC$ using (i) Sum of minterms. (ii) Sum of Maxterms. (3+3)

   (b) Realize the above simplified boolean expression using NAND-NAND and NOR-NOR Logic gates. (2+2)

2. (a)What is sequential circuit? Draw a diagram of a JK master slave flip-flop and describe its operation. (1+5)

   (b)Show how a SR Flip-Flop can be converted to JK Flip-Flop? (4)

3. (a) What is shift register? What is universal shift register You have 2 bit parallel data. How can you transform it in serial form? (1+1+3)

   (b) Design a bi-directional 3-bit shift register. (5)

4. (a) What is counter? Design a synchronous counter which has only (00) and (10) states. (1+4)

   (b) Design a MOD-2 counter and draw output wave-form.

5. (a)What do you mean by bi-stable, mono stable and astable multivibrator? Design a bi-stable multivibrator with 555 timer with a proper circuit diagram. (2+5)

   (b) Give the schematic idea of 7 segment display system. (3)

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