(i) Printed Pages : 3 Roll No. .....

(ii) Questions : 7 Sub. Code : 0 5 4 5

Exam. Code : 0 0 0 6

B.A./B.Sc. (General) 6th Semester

(2053)

PHYSICS

Paper—B : Electronics and Solid State Devices-II

Time Allowed : Three Hours] [Maximum Marks : 44

Note :— Attempt **five** questions in all, including Question No. 7 (Unit-III) which is compulsory and selecting **two** questions each from Unit I & II. Use of non-programmable calculator is allowed.

UNIT—I

1. (a) Draw the structure of an n-channel depletion type MOSFET. Explain how the depletion region is formed in the channel. Can depletion type MOSFET be operated in enhancement mode ? 6

   (b) A common source FET amplifier uses a load resistance 200 kΩ. If a.c drain resistance and transconductance of FET are 100 kΩ and 0.15 mA/V respectively. Calculate the magnitude of the voltage gain of the amplifier. 3

2. (a) What is feedback ? Explain how does the gain of the amplifier can be stabilized with the help of negative feedback and also helps in reducing the non-linear distortion. 6

(b) Draw an emitter follower circuit diagram. Justify that it is a common collector amplifier circuit. 3

3. Sketch the circuit of Wein-Bridge oscillator. Explain the principle of its operation and find an expression for the frequency of oscillations. Show that the amplifier used in it must have a gain greater than 3 for sustained oscillations. 9

UNIT—II

4. (a) What is multivibrator ? Derive an expression for frequency and duty cycle of astable multivibrator using IC555. 6

(b) Draw the block diagram of OP-AMP. Write its characteristics. 3

5. (a) Show that when a radio wave enters the ionosphere, its phase velocity is greater than the velocity of light. 6

(b) The maximum peak to peak voltage of an AM wave is 8mV and minimum peak to peak voltage is 4mV.

Calculate :

(i) the percentage modulation

(ii) the amplitude of the unmodulated carrier wave. 3

6. (a) How do you realize OR gate using NAND gate ? Draw its symbol and truth table. 3

(b) State and prove De Morgan's theorem. 3

(c) Construct a simplified logic circuit having output

$$Y = A.B + A.(B + C) + B.(B + C)$$ 3

UNIT—III

(Compulsory Question)

7. Attempt any **eight** parts :

(a) Explain why audio signals are used to modulate a carrier wave for their transmission.

(b) What do you understand by minterms and maxterms ?

(c) What do you mean by open loop and closed loop amplification of OP-Amp ?

(d) Explain the term virtual height in case of sky waves.

(e) State the condition under which a feedback amplifier works as an oscillator.

(f) Define common mode rejection ratio.

(g) What is pinch off voltage ?

(h) Define transconductance and amplification factor of a FET.

(i) In ionosphere, why sky wave propagation is generally better at nights than during the day ?

(j) Convert the following decimal number $(10.625)_{10}$ to binary number. $8 \times 1 = 8$