(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

(2054)

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 Units-I & II. Use of a non-programmable calculator is allowed.

UNIT—I

1. (a) How does FET act as an amplifier ? Derive an expression for voltage gain in case of a common source FET amplifier. 6

(b) Sketch the structure and symbol of n-channel depletion type MOSFET. 3

2. (a) What are the advantages of negative feedback ? Explain how the negative feedback helps in improving the gain stability and reducing the noise distortion. 6

(b) An amplifier with a voltage gain of 450. This gain is reduced to 100 when negative feedback is applied. Determine the reverse transmission factor β and express the amount of feedback in decibels (dB). 3

3. State and explain Barkhausen's criterion for sustained oscillations. Draw the circuit diagram of the Hartley oscillator and discuss its working. Also, determine the condition for sustained oscillations of the Hartley oscillator. 9

UNIT—II

4. (a) What is a multivibrator ? Derive an expression for the frequency and duty cycle of a monostable multivibrator using IC 555. 6

(b) Discuss the working of OP-AMP as a Differentiator. 3

5. (a) Prove that the phase velocity of a plane electromagnetic wave in an ionized medium exceeds the velocity of light in free space. 6

(b) Show that the modulation index for frequency modulation is directly proportional to the amplitude and inversely proportional to the frequency of the modulating signal. 3

6. (a) Give the equivalent circuit, truth table, and logic symbol for NAND logic gate. 3

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

(c) Solve the following Boolean expression and draw the simplified logic circuit :

$$\overline{A}\,\overline{B}\,\overline{C} + \overline{A}\,B\,\overline{C} + A\,\overline{B}\,\overline{C} + A\,B\,\overline{C}.$$ 3

UNIT—III

(Compulsory Question)

7. Attempt any *eight* parts :—

(a) Why OP-Amp is generally not used in open loop mode ?

(b) What is the need for modulation ?

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

(d) What is the effect of negative feedback on input and output impedance ?

(e) Explain the term skip distance.

(f) Name the various modes of propagation of radio waves.

(g) Define common mode rejection ratio.

(h) What is pinch-off voltage ?

(i) What is the differential gain and common mode gain of a differential amplifier ?

(j) In the ionosphere, why sky wave propagation is generally better at nights than during the day ? $8 \times 1 = 8$