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(February)

ELECTRONICS

(Elective/Honours)

(Feedback and Oscillator, Multivibrator, Operational amplifier, Digital Electronics—I)

[ELEC–301 (T)]

Marks : 56

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **one** question from each Unit

UNIT—I

1. *(a)* Draw a neat block diagram showing feedback action of an amplifier.

(b) Deduce the relation between voltage gain with feedback A_{vf} and voltage gain without feedback A_v and mention the conditions for negative and positive feedback.

(c) Mention the important properties of negative feedback (without deduction).

(d) Discuss in brief with suitable diagram, amplitude distortion.

(e) Discuss in brief with suitable diagram, frequency distortion in an amplifier. 3+3+2+3+3

2. *(a)* Draw a block diagram showing the essential parts of an oscillator circuit.

(b) What are the two basic requirements which need to be satisfied for a circuit to oscillate?

(c) Discuss in brief the working of a basic *L-C* tank circuit as an oscillator and mention the problem faced if one uses it as an oscillator.

(d) Discuss in brief with suitable diagram, a Wien bridge oscillator. 2+2+5+5

UNIT—II

3. *(a)* Mention a few uses of a multivibrator.

(b) Draw the circuit diagram of astable multivibrator using transistor. Explain with necessary timing diagram, the working of astable multivibrator using transistor.

(c) Discuss with a neat circuit diagram, the working of bistable multivibrator.

(d) Determine the time period and frequency of oscillation for an astable multivibrator with the following component values :

R_1 2 k , R_L 10 k , C_1 0 01 F,

C_2 0 1 F 1+6+4+3

4. *(a)* Draw the pin diagram of IC 555 timer with proper labelling.

(b) Discuss with necessary circuit diagram, the working of a monostable multivibrator with IC 555 timer.

(c) Draw the circuit diagram of astable multivibrator using OP-AMP. Discuss with necessary timing diagram how the output voltage level is shifted. 2+6+6

UNIT—III

5. *(a)* Discuss the working of a differential amplifier.

(b) Derive the expression of voltage gain of a non-inverting amplifier. 7+7

6. *(a)* Derive an expression for voltage gain of an active low-pass filter designed with an OP-AMP.

(b) What is a virtual ground?

(c) A differential amplifier has differential gain and common-mode gain of 150 and 0·5 respectively. Find the CMRR in dB.

(d) Derive an expression for output of an integrator circuit designed with an OP-AMP. 6+2+2+4

UNIT—IV

7. *(a)* Convert the following binary numbers into their decimal equivalent :

(i) 0·01

(ii) 1·01

(b) Convert the following decimal numbers into their binary equivalent :

(i) 4·25

(ii) 0·562

(c) Convert the following octal numbers into their hex equivalent :

(i) $(305)_8$

(ii) $(0\ 47)_8$

(d) Represent the following decimal numbers in 1's complement form :

(i) 15

(ii) 31

(e) Find 2's complement of the following numbers :

(i) $(11011)_2$

(ii) $(10001)_2$

(f) Add the following two numbers using 2's complement method :

$$\begin{array}{r} -27 \\ \underline{35} \end{array}$$

Add = 2+2+2+2+2+4

8. *(a)* Simplify the following three-variable expression using Boolean algebra :

$Y(A, B, C) \quad m(0, 2, 4, 6)$

(b) Minimize the following expression using *K*-map :

$Y(A, B, C) \quad m(0, 1, 3, 5)$

(c) Convert the following Boolean function into the standard POS form and express in max-terms :

$Y(A, B, C) \quad (A \quad B)(B \quad C)(A \quad \overline{B} \quad \overline{C})$

(d) Write down the truth table of a three-input EXOR gate and EXNOR gate. Also using basic gates, draw the circuit for an EXOR gate. 3+3+5+3

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