Total number of printed pages: 2

D/4th /DIE401

2024

ELECTRONICS DEVICES AND CIRCUITS-II

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. a) Explain voltage and transconductance amplifiers with the help of Thevenin's and Norton equivalent circuits — 2 x 3=6

   b) Explain the feedback connection with different networks. — 8

   c) Write different feedback topologies. — 4

   d) Fill in the blanks: — 2

   (i) Negative feedback reduces _____.

   (ii) In feedback amplifier sensitivity is given by _____.

2. a) Derive the expression for voltage gain with negative feedback. — 7

   b) Explain the advantages of a negative feedback amplifier. — 3

   c) Show that change in gain with feedback is less than the change in gain without feedback by a factor (1+βA). — 8

   d) Fill in the blanks: — 2

   (i) _____ feedback amplifier decrease the voltage gain.

   (ii) An emitter follower is mostly used as it has _____ input impedance and _____ output impedance.

3. a) Describe the Barkhausen Conditions. — 3

   b) Give true or false: — 2

   (i)An oscillator produces undamped oscillations.

   (ii)An LC oscillator cannot be used to produce very low frequencies.

   c) Depict the circuit diagram of a Colpitts oscillator and explain its operational mechanism. — 8

   d) A Colpitt's oscillator has a coil with inductance of 120 μH, C_1=300pF and C_2=1200pF. Find frequency of oscillations and minimum gain required for — 7

amplifier to have sustained oscillations.

4. a) Explain the functioning of the Wein bridge oscillator circuit and derive the equation governing its oscillation frequency. 6+6=12

c) Write True or False: 3

(i)Crystal oscillators are typically less accurate and stable compared to other types of oscillators.

(ii)Crystal oscillators does not rely on the mechanical resonance of a quartz crystal for generating stable oscillations.

(iii) RC phase shift oscillators require an inductor in the feedback network to sustain oscillations.

d) Describe the fundamental operating principle behind the RC phase shift oscillator. 5

5. a) Explain the block diagram of op-amp. Also, give the application of op-amp. 4+3=7

b) Define Slew Rate and CMRR. 2

c) Determine the output voltage of an op-amp for the input voltages of 300 μV and 240 μV. The differential gain of the amplifier is 5000 and the value of the CMRR is 10^5. 4

d) Write True or False: 3

(i)Common mode gain is very high

(ii)Current cannot flow to ground through a virtual ground.

(iii)Op-amp can amplify both AC and DC signals.

e) Write various ideal characteristics of operational amplifier. 4

6. a) Draw inverting amplifier using op-amp and derive an expression for its output voltage. 7

b) Draw the subtractor circuit using op-amp and derive the expression for the output voltage. 7

c) A 5 mV, 1 kHz sinusoidal signal is applied to the input of an op-amp integrator for which R1=100 kΩ and C=1 μF. Find the output voltage. 6

7. Write short notes on any four of the following: 5x4=20

i) Single Tuned amplifier

ii) Voltage Follower

iii) Astable Multivibrator

iv) Crystal oscillator

v) Integrator