19P1045

Reg. No ..... Name .....

MSc DEGREE END SEMESTER EXAMINATION - OCTOBER 2019

SEMESTER 1 : PHYSICS

COURSE : **16P1PHYT04 : ELECTRONICS**

(For Regular - 2019 Admission and Supplementary - 2016/2017/2018 Admissions)

Time : Three Hours Max. Marks: 75

Section A

Answer any 5 (1 marks each)

1. The differential gain is ……
   a. very high
   b. very low
   c. dependent on input voltage
   d. about 100

2. When a differential amplifier is operated single-ended, ……
   a. the output is grounded
   b. one input is grounded and signal is applied to the other
   c. both inputs are connected together
   d. the output is not inverted

3. Which of the following causes change in gain and phase shift?
   a) All of the mentioned
   b) Internally integrated inductors
   c) Internally integrated Capacitor
   d) Internally integrated Resistor

4. In op-amp, signal applied at inverting terminal appears at output terminal with a phase
   a. 0
   b. 90
   c. 180
   d. 45

5. Name the filter that has two stop bands?
   a) Band-pass filter
   b) Low pass filter
   c) High pass filter
   d) Band-reject filter

(1 x 5 = 5)

Section B

Answer any 7 (2 marks each)

6. Define input offset voltage and explain why it exists in all op-amps?
7. Define CMRR and explain its significance of large value of CMRR?
8. List two special cases of inverting amplifiers. Which one is most widely used and why?
9. Why is a resistor R_{OM} not needed in differential op-amp circuits?
10. Define break frequency and bandwidth?
11. Explain the effect of negative feedback on frequency response?

12. What are the major advantage and disadvantage of a single supply ac amplifier?
13. State two basic criteria required for oscillations in oscillators?
14. Design a high-pass filter at cutoff frequency of 1 kHz with a passband gain of 2. Also plot the frequency response curve.
15. What is a sample and hold circuit? Why is it needed?

(2 x 7 = 14)

Section C
Answer any 4 (5 marks each)

16. The following specifications are given for a differential amplifier using two op-amps. R_1= R_3= 680 Ω, R_F= R_2= 6.8 kΩ, v_x=-1.5 V pp and v_y= -2 V pp sine waves at 1 kHz. The op-amp is 741c. Calculate (a) the voltage gain and the input resistance and (b) the output voltage of the amplifier. Assume that the output is initially nulled (V_{ooT}= 0V).
17. Design a compensating network for the LM307 op-amp. Draw the circuit diagram. The op-amp uses ± 10 V supply voltages. (The input offset voltage specified in the data sheet for LM307 is 10 mV).
18. For an ac non inverting amplifier with a single power supply using IC 741, R_{in} =50Ω, C_1=C_i= 0.1 µF, R_1= R_2=R_3= 100 kΩ, R_F= 1 MΩ, and supply voltages =±15 V. Determine the bandwidth of the amplifier?
19. In a differential instrumentation amplifier using a transducer bridge, R_1=1 kΩ, R_F= 4.7 kΩ, R_A= R_B=R_C= 100 kΩ, V_{dc}=+5 V and supply voltages =±15 V. The transducer is thermistor with following specifications: R_T=100 kΩ at a reference temperature of 25°C, temperature co-efficient of resistance =-1 kΩ/°C . Determine the output voltage at 0°C and at 100°C.
20. Design a 60 Hz active notch filter?
21. Design a wide band-pass filter with f_L = 200 Hz., f_H = 1 kHz and a pass band gain of 4. Draw the frequency response plot of this filter. Also calculate the quality factor, Q of the filter?

(5 x 4 = 20)

Section D
Answer any 3 (12 marks each)

22.1. With the help of suitable circuit diagrams, derive the expressions for (i) voltage gain (ii) input resistance and (iii) output resistance of a voltage-series feedback amplifier. Explain why the non-inverting amplifier with feedback is called a perfect voltage amplifier?

OR

2. What is an instrumentation amplifier? Explain the working of instrumentation amplifier using Transducer Bridge.

23.1. Explain the difference between (i) inverting and differential summing amplifier and (ii) inverting and non-inverting averaging amplifier.

OR

2. (a) Discuss the theory of operation of a first order high pass Butterworth filter using op-amp. (b) Design a high-pass filter at cutoff frequency of 1 kHz with a passband gain of 2. Also plot the frequency response curve.

24.1. With necessary theory and circuit diagrams, explain the working of (a) wide band-pass filter and (b) a narrow band-pass filter?

OR

2. (a)With the help of suitable diagrams, explain the working of a square-wave generator using op-amp. (b) Design a square wave oscillator, so that fo =1 kHz. The op-amp is a 741 with dc supply voltages = ± 15 V.

(12 x 3 = 36)