Reg. No ..... Name **18P145**

M.Sc DEGREE END SEMESTER EXAMINATION - NOVEMBER 2018

SEMESTER 1 : PHYSICS

COURSE : **16P1PHYT04 : ELECTRONICS**

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

Time : Three Hours Max. Marks: 75

Section A
Answer any 5 (1 marks each)

1. A differential amplifier .....

   a. is a part of an Op-amp
   b. has one input and one output
   c. has two outputs
   d. answers a and b

2. The output of a particular Op-amp increases 8V in 12μs. The slew rate is .....

   a. 90 V/μs
   b. 0.67 V/μs
   c. 1.5 V/μs
   d. none of these

3. IC 741c op-amp belongs to
   a) None of the mentioned
   b) Uncompensated op-amp
   c) Non-compensated op-amp
   d) Compensated op-amp

4. Input resistance of op-amp is

   a. very high
   b. very low
   c. zero
   d. one

5. Which filter performs exactly the opposite to the band-pass filter?
   a) Band-reject filter
   b) Band-stop filter
   c) Band-elimination filter
   d) All of the mentioned

(1 x 5 = 5)

Section B
Answer any 7 (2 marks each)

6. Explain briefly why negative feedback is desirable in amplifier applications?
7. Why is a resistor R_{OM} not needed in differential op-amp circuits?
8. Why is the output offset voltage generated by the input bias current always larger than that generated by the input offset current?

9. What is frequency response? What do you understand by the term, 'Butterworth response'?
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. List the important characteristics of a comparator?
14. What is meant by zero-crossing detector?
15. What is the difference between a basic comparator and the Schmitt trigger?

(2 x 7 = 14)

Section C
Answer any 4 (5 marks each)

16. Determine the output voltage in each of the following cases for an open-loop differential amplifier (a) v_{in1}=5 μV dc, v_{in2}=-7 μV dc, (b) v_{in1}=10 mV rms, v_{in2}= 20 mV rms. The op-amp is a 741 with the following specifications A=200000, R_1=2 MΩ, Ro=75 Ω , $+V_{CC}$=+15 V, $-V_{EE}$ = -15 V and the output voltage swing =±14 V.
17. For a closed loop inverting amplifier using IC 741 , determine the value of the output voltage if the input is 1-V pp sine wave at 1 kHz. Also sketch the output waveform. Assume that V_{ooT}=0 V. Given R_1=470 Ω, R_F=4.7 kΩ, A=200,000, R_i=2 MΩ, Ro=75Ω, f_o=5Hz, supply voltage=±15 V and output voltage swing=±13 V
18. 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.
19. With the help of suitable input and output waveforms, explain how an op-amp can be used as a Differentiator?
20. Design a wide band-reject filter having f_H =200 Hz and f_L= 1 kHz.
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. What are the two differential amplifier configurations? Briefly compare and contrast these configurations with corrosponding circuit diagrams

OR

2. (a)With the help of suitable diagrams, obtain the equation, which can be used to design the offset-voltage compensating network in an op-amp. (b) 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).

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

OR

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

24.1. (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.

OR

2. Distinguish between first order and second order filters. Discuss the theory of operation of a first order low pass filter using op-amp.

(12 x 3 = 36)