MODEL QUESTIONS FOR 5TH SEM _PHYSICS_NEP2020
TOPIC: Digital, Analog Circuits and Instrumentation/ Elements
DSE of Modern Physics

1. What is CMMR of an OP-AMP?

2. What are the main characteristic of an ideal OP-AMP?

3. Explain the term of -ve feedback and virtual ground of OPAMP.

4. Draw the schematic diagram and derive the expression of voltage adder,subtracter,differentitor and intigator of OPAMP?

5. Discuss the use of an OPAMP as an inverting amplifiers.

6. What should be the input registance,out put registance ,voltage gain,and bandwidth of an ideal OPAMP?

7. Draw the ckt diagram of a Wien-bridge oscillator with an operational apmlifier as an active element?

8. What is schmitt trigger?

9. An amplifier has an output signal of 2 V for an input of 50 mV. What is A'_v?
(Hints- find the ordinary gain.
A_v = 2/0.05 =40
then use
$A_v = \log_{10^{-1}} A'_v /20)$
10. A power amplifier has a maximum output of 120 W. What is this power in dBW?
(Hints- P ' =10log $_{10}$P/1 Watt
P ' =10log $_{10}$120 W/1 W
P ' =20.8 dBW)

11. A studio microphone produces a 12 dBm signal while recording normal
speech. What is the output power in watts?

12. An amplifier has a lower break frequency of 40 Hz. How much gain is lost at 10 Hz?

(Hints- $A'_v = -10 \log_{10}\left(1 + f^2_c / f^2\right)$

$A'_v = -10 \log_{10}\left(1 + 40^2/10^2\right)$

$A'_v = -12.3$ dB)

13. What is an op amp?

14. Give several examples of where op amps might be used.

15. What is the typical stage layout of an op amp?

16. What comprises the first stage of a typical op amp?

17.. What comprises the final stage of a typical op amp?

18. How does integrated circuit design differ from discrete design?

19. What is a comparator, and how might it be used?

20. What is meant by monolithic planar construction?

21. What is a mask, and how is it used in the construction of IC op amps?

22. What is the process of diffusion and how does it relate to the construction of
IC op amps?

23. What are the advantages of monolithic IC construction?
24. How does hybrid construction differ from monolithic construction?

Feedback

1.Give two examples of how negative feedback is used in everyday life.
2. What circuit parameters will negative feedback alter, and to what extent?

3. Name the different negative feedback connections (i.e., variants or forms).
4. How might negative feedback accidentally turn into positive feedback?
5. What circuit parameters won't negative feedback effect?

6. What forms of feedback are used for the inverting and noninverting voltage
amplifiers?
7. What forms of feedback are used for the current-to-voltage and voltage-to-
current transducers?
8. What form of feedback is used for the inverting current amplifier?
9 . What are the op amp analysis idealizations?
10. What is virtual ground?
11. What is a summing amplifier?
12. How can output current by increased?
13. What circuit changes are needed in order to bias an op amp with a unipolar
supply?
14. What operational parameters change when a circuit is set up for single
supply biasing?
15. How might a circuit's gain be controlled externally?
16. What is meant by the term “floating load”

DIGITAL :

- Find the decimal equivalent of the following binary numbers expressed in the 2’s complement format:

(a) 00001110;
(b) 10001110.

- Find the binary equivalent of $(13.375)_{10}$.

- Find the octal equivalent of $(73.75)_{10}$

- Determine the hexadecimal equivalent of (82.25) 10

- Do the following conversions:
  (a) eight-bit 2’s complement representation of (−23) 10 ;
  (b) The decimal equivalent of (00010111) 2 represented in 2’s complement form.
- Show that:
  (a) (13A7) 16 = $(5031)_{10}$;
  (b) (3F2) 16 = $(1111110010)_{2}$.

- Outline the different steps involved in the addition of larger-bit binary numbers for the following two cases:
  (a) The larger of the two numbers is positive and the other number is negative.
  (b) The larger of the two numbers is negative and the other number is positive.
- What decides whether a particular binary addition or subtraction operation would be possible with 2's complement arithmetic?
- Perform the following operations using 2's complement arithmetic. The numbers are represented using 2's or 10's or 16's complement notation as the case may be. Express the result both in 2's complement binary as well as in decimal. (a) $(7F)_{16} + (A1)_{16}$.
  (b) $(110)_{10} + (0111)_{2}$.
- How would you hardware-implement a four-input OR gate using two-input OR gates only?
- How do you distinguish between positive and negative logic systems? Prove that an OR gate in a positive logic system is an AND gate in a negative logic system.
- Give brief statements that would help one remember the truth table of AND, NAND,
  OR, NOR, EX-OR and EX-NOR logic gate functions, irrespective of the number of inputs
  used.
- Why are NAND and NOR gates called universal gates? Justify your answer with the help of
  examples.

- What are logic gates with open collector or open drain outputs? What are the major advantages and disadvantages of such devices?

SEMICONDUCTOR:

Chapter-1

1.Describe the differences between a conductor, an insulator and a semiconductor.
2. Define the terms Fermi level, valence band, conduction band and band gap.
3. What is the fundamental difference between an intrinsic crystal and an extrinsic crystal?
4. What is meant by the term doping?
5. What is the effect of donor and acceptor impurities on the Fermi level?

Chapter-2

1. What is a depletion region?
2. Draw and explain the energy diagram for a PN junction, including the Fermi level.
3. Describe and compare the three diode models.
4. Explain the difference between the effective DC resistance and AC resistance of a diode.

5. List some of the practical differences between switching diodes, Zener diodes and LED s

Chapter-3

1. List the advantages and disadvantages of half-wave versus full-wave rectifiers.
2. Discuss the advantages and disadvantages of a full-wave bridge rectifier versus a two diode center-tapped rectifier.
3. What is the purpose of the capacitor in a rectifier/power supply circuit?
4. Under what load conditions will a Zener regulator fail to maintain regulation of the output voltage?
5. What is ripple? How might it be reduced?
6. What is the function of the DC source(s) in a biased clipper?
7. What is the function of the capacitor in a clamper circuit?

Chapter4-

2 Describe the energy diagram for a forward-reverse biased BJT .
3 Define α.
4 Define β.
4 Define Early voltage. What is its significance?
5 What is a family of collector curves? What information can we derive from it?
6 Explain some of the issues involving variation of β.
7 What is a DC load line?
8 How is a saturating switch different from a non-saturating driver? What are the advantages and disadvantages of each?
9 Explain the need for DC biasing. Why can't we just apply an AC signal to the base of a BJT and expect proper amplification of the signal?
10. What is a Q point?
11. What are the four values found on a DC load line?
12. Rank the bias configurations presented in this chapter in terms of their Q point stability relative to β.
13. Rank the bias configurations presented in this chapter in terms of their circuit complexity.
14. Describe the process of making a PNP version of an NPN bias circuit.
15. Define class A operation.
16. Why are voltage followers generally preferred over voltage amplifiers for power output applications?
17. How does an AC load line differ from a DC load line?
18. What is the advantage of having a centered Q point on the AC load line?
19. What effect does a reactive load have on an AC load line?
20. Describe the operation of a dynamic loudspeaker.
21. What are heat sinks? What are they used?
22. What is thermal resistance?

23 Compare the operation of the JFET to the BJT .
24 Compare the regions of JFET drain curves to those of BJT collector curves.
25 Why is the JFET referred to as a square-law device?

26. What is pinch-off voltage?
27. How does the JFET DC biasing model differ from the BJT DC model?
28 What are the differences between JFET s and MOSFET s?
29 What are the differences between DE-MOSFET s and E-MOSFET s?
30 Why are MOSFET s sometimes referred to as “Insulated Gate” or IGFET s