KATHMANDU UNIVERSITY
End Semester Examination
June/July, 2023

Marks Scored:

Level : B.E.
Year : II

Course : EEEG 204
Semester : I

Exam Roll No.:

Time: 30 mins.

F. M. : 10

Registration No.:

Date : 19 JUL 2023

SECTION "A"

[20Q. × 0.5 = 10 marks]

Encircle the most appropriate option. Symbols have their usual meaning.

1. Which of the following is true for N-type semiconductor?
   a. Pentavalent impurities are added
   b. Majority charge carriers are holes
   c. Fermi Level is near valence band
   d. Ratio of minority and majority charge carriers is unity

2. The application of external voltage to the terminals of diode is termed as _____.
   a. Scattering b. Photon c. Bias d. Diffusion

3. The reverse breakdown voltage of a diode refers to:
   a. The voltage at which the diode conducts current in the reverse direction
   b. The voltage at which the diode blocks current in the reverse direction
   c. The maximum voltage that can be applied across the diode in the reverse direction without causing damage
   d. The voltage at which the diode switches from forward bias to reverse bias

4. How does a Zener diode regulate voltage?
   a. By dissipating excess voltage as heat
   b. By limiting the current flow in the circuit
   c. By maintaining a constant voltage drop across its terminals
   d. By converting AC voltage to DC voltage

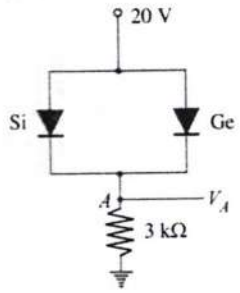

Figure 1

5. Find the output voltage V_A for the circuit shown in Figure 1
   a. 12.6V b. 13V
   c. 19.3V d. 19.7V

6. In a center-tapped full wave rectifier, how many diodes are used?
   a. 1 b. 2 c. 3 d. 4

7. What is the voltage gain of a common base amplifier?
   a. Less than 1 b. Equal to 1
   c. Greater than 1 d. Depends on biasing condition

8. In a common emitter configuration, the input current is:
   a. Base current (I_B)
   b. Emitter current (I_E)
   c. Collector current (Ic)
   d. Both base and emitter currents combined ($I_B + I_E$)

9. In CE configuration, BJT allows for amplification in _____.
   a. Saturation region
   b. Cut-off region
   c. Active region
   d. Reverse-biased region

10. Ideally, the input impedance of an op-amp is _____.
   a. Very low
   b. Very high
   c. Equal to the output impedance
   d. Zero

11. The summing amplifier configuration is often used in applications such as:
   a. Audio amplification
   b. Voltage regulation
   c. Frequency modulation
   d. Switching

12. Which of the following applications of op-amp does not require feedback?
   a. Comparator b. Integrator c. Subtractor d. Adder

13. Which logic gate gives an output of high (1) only if exactly one of its inputs is high (1)?
   a. AND b. OR c. NOT d. XOR

14. Which of the following is universal gate?
   a. AND b. OR c. XOR d. NAND

15. The Boolean expression $\overline{A}.B + A.\overline{B}. + A.B$ is equivalent to
   a. A+B b. $\overline{A}.+B$ c. $\overline{B}.+A$ d. A.B

16. Which Boolean identity states that performing the OR operation with the same variable will yield the same result as performing it once?
   a. Idempotent Law b. Identity Law c. Distributive Law d. Absorption Law

17. Which type of instrument works on the principle of attraction and repulsion?
   a. PMMC
   b. Moving Iron
   c. Electrodynamometer
   d. Moving Coil

18. In moving iron instrument, the deflecting torque is proportional to:
   a. Square of the current flowing through the moving coil
   b. Current flowing through the moving coil
   c. Magnetic field strength
   d. Square of the magnetic field strength

19. Which type of instrument is most commonly used as a wattmeter?
   a. PMMC instrument
   b. Moving iron instrument
   c. Electrodynamometer instrument
   d. None of the above

20. What is the purpose of signal conditioning in a data acquisition system?
   a. To convert analog signals to digital format
   b. To amplify and filter weak analog signals
   c. To store and process digital data
   d. To transmit data over a network

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Level : B.E.
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Time : 2 hrs. 30 mins.

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Semester : I
F.M. : 40

SECTION "B"
[4Q × 10 = 40 marks]

19 JUL 2023

Attempt *ANY FOUR* questions. Missing data may be suitably assumed. Each symbol carries their usual meaning

1. a. Discuss the working of practical diodes with the help of V-I characteristic curve. [4]

   b. Why is Zener Diode used as a voltage regulator? Explain. [3]

   c. An a.c. supply of 230 V is applied to a half-wave rectifier circuit through a transformer of turn ratio 10 : 1. Find (i) the output d.c. voltage and (ii) the peak inverse voltage. Assume the diode to be ideal [3]

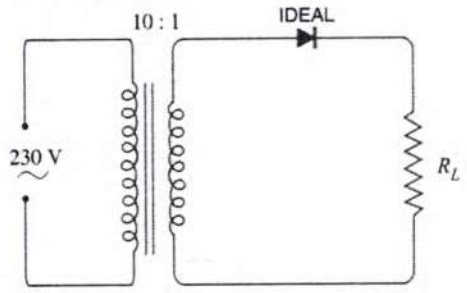

Figure 1

2. a. Derive the voltage gain for inverting and non-inverting op-amp. [3+3]

   b. Design a subtractor using summing amplifiers and explain how it works. [4]

3. a. Explain the working principle of PNP transistor. [3]

   b. In a common base connection, $\alpha = 0.95$. The voltage drop across 2 kΩ resistance which is connected in the collector is 2V. Find the base current. [3]

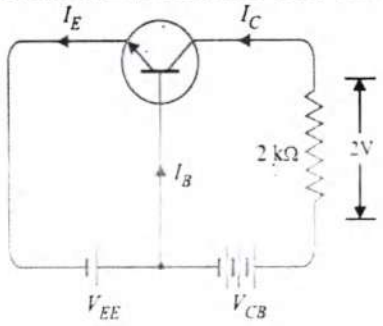

Figure 1

c. Determine the Q point of the transistor circuit shown in Figure 3. Also draw the d.c. load line. Given $\beta = 200$ and $V_{BE} = 0.7V$ [4]

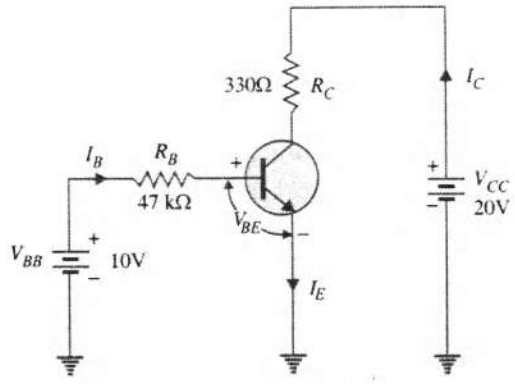

Figure 3

4. a. Construct XNOR gates using NOR gates only. Explain each step and mention all Boolean identities used. [4]

b. Simplify: $F = \overline{A}\,\overline{B}\,C + A\,\overline{B}\,\overline{C} + AB\overline{C} + A\overline{B}\,C + ABC$. Also, draw the logic diagram. [2+2]

c. State duality principle. Write dual of function: A.(B.C) = (A.B).C [2]

5. a. Explain the construction, working and torque equation of PMMC type instrument. [6]

b. Explain Data Logger with its components. [4]