KATHMANDU UNIVERSITY
End Semester Examination [C]
May/June, 2019

Marks Scored:

Level : B. E./B.Sc.
Year : II

Course : EEEG 211
Semester: I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date 07 JUN 2019

SECTION "A"
[20 Q × 1 = 20 marks]

Choose the most appropriate answer. Symbols have their usual meaning.

1. Circuit shown in Figure 1 is _____.
   [a] small signal model of an amplifier
   [b] large signal model of an amplifier
   [c] small signal model of a diode
   [d] large signal model of a diode.

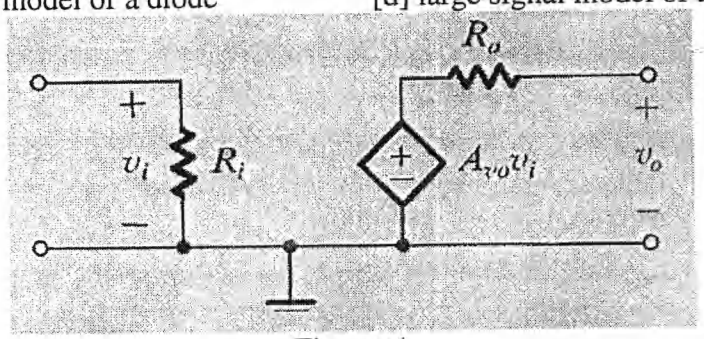

Figure: 1

2. Voltage gain of an amplifier _____.
   [a] must be less than 1
   [b] must be very large
   [c] must be negative
   [d] is dimensionless

3. Frequency response curve of an amplifier shows variation of _____.
   [a] voltage with frequency
   [b] time with frequency
   [c] phase with frequency
   [d] current gain with frequency

4. dBm is a unit used to express _____.
   [a] voltage gain [b] current gain [c] volatge [d] power

5. Analog signal rectification is normally done by using _____.
   [a] a resistor
   [b] a capacitor
   [c] a diode
   [d] a transistor

6. Two diodes connected in series can be considered as _____.
   [a]a battery of 1.4 volts
   [b]a current source of 0.7 A
   [c]a battery of 2.8 volts
   [d]a current source of 2.8 A

7. Bipolar Junction Transistor has _____junctions.
   [a] 5 [b] 4 [c] 3 [d] 2

8. The relation, $I_C = \beta I_B$ is valid for a transistor operating in _____ region.
   [a] saturation [b] cut-off [c] active [d] triode

9. A Bipolar Junction Transistor operating in the active region has maximum _____.
[a] base current [b] emitter current [c] collector current [d] gate current

10. g_m of a Bipolar Junction Transistor relates _____.
[a] collector current with collector potential
[b] emitter current with emitter potential
[c] collector current with emitter to base potential difference
[d] base current with collector to base potential difference

11. If V_{CE} in the circuit of Figure 2 is V_{CC}, the transistor is working in the _____region.
[a] active [b] cut-off [c] triode [d] saturation

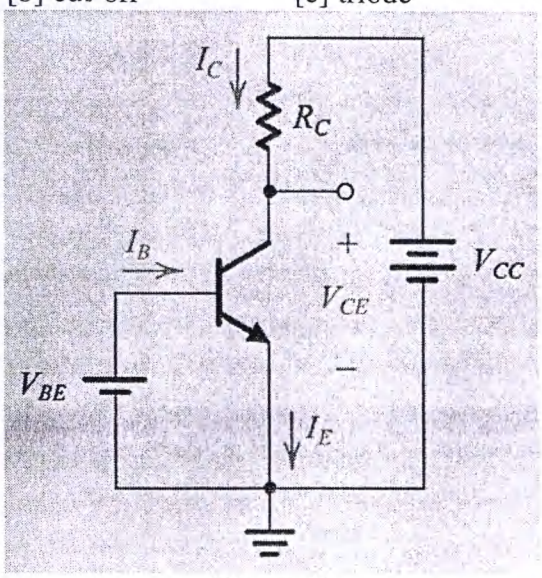

Figure: 2

12. In a NMOS Field Effect Transistor operating in the active region, overdrive voltage is _____.
[a] $V_{GS}+V_t$ [b] $V_{GS}-V_t$ [c] $V_{SG}+V_t$ [d] $V_{SG}-V_t$

13. In the circuit of Figure 3, the transistor will operate in the _____region.
[a] cut-off [b] saturation [c] triode [d] deep triode

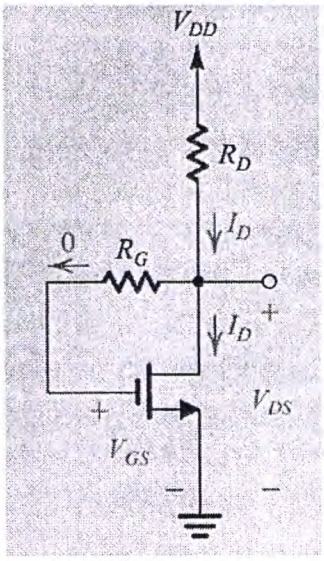

Figure: 3

14. The input impedance of a MOS Field Effect Transistor is _____.
[a] 0 Ω [b] 1 MΩ
[c] ∞ [d] bias current dependent

15. Typical class B amplifiers have _____transistor/s.
[a] 1 [b] 2 [c] 3 [d] 4

16. _____ amplifier needs biasing.
[a] class A [b] class B [c] class C [d] class D

17. The maximum efficiency of a class A structure is _____%.
[a] 25 [b] 60 [c] 78 [d] 80

18. Operational amplifier amplifies _____.
[a] ratio of two input signals [b] product of two input signals
[c] sum of two input signals [d] difference of two input signals

19. If two inputs of a differential amplifier are equal, the output voltage _____.
[a] becomes zero [b] reaches maximum
[c] reaches minimum [d] saturates

20. In a typical differential amplifier structure, there are _____ transistors.
[a] 5 [b] 4 [c] 3 [d] 2

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SECTION "B"

[5Q. × 11 = 55 marks]

Attempt *ANY FIVE* questions.
Assume suitable data where necessary.
All Symbols have their usual meanings.

1.

a. Derive an expression for small signal resistance of a diode when it is forward biased by I_D current at room temperature. [5]

b. Draw and explain the peak of the peaks detector circuit. [6]

2.

a. With figure, explain cut-off region, active region, and saturation region of a Bipolar Junction Transistor. [5]

b. Show that the transistor of Figure 1 is working in the saturation region. [6]

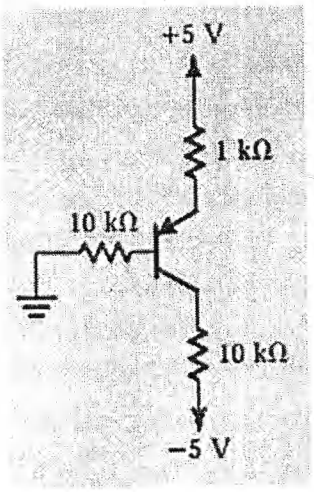

Figure: 1

3.

a. The NMOS in the circuit of Figure 2 has threshold voltage of 1V, $k_n'(W/L) = 1$ mA/V^2, and $V_D = 0.1$ V. Find the value of R_D. [5]

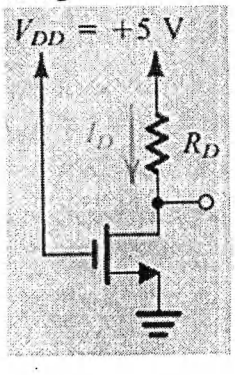

Figure: 2

b. With explanation, draw drain current (i_D) versus gate to source potential difference (v_{GS}) and drain current (i_D) versus drain to source potential difference (v_{DS}) for a NMOS type Field Effect Transistor operating in the active region. [6]

4.

a. Draw the small signal equivalent circuit of a NMOS Field Effect Transistor and NPN Bipolar Junction Transistor. [5]

b. What is frequency response of an amplfier? In the frequency response curve, show the upper and lower 3 dB frequencies. [6]

5.

a. Draw typical circuit of class A and class B amplifiers. What is cross over distortion in class B amplifier? [5]

b. Derive an expression for efficiency of a class A amplifier. Also find maximum efficiency that can be achieved by class A amplifier? [6]

6.

a. Draw a circuit of a differential amplifier and explain its working. Use Bipolar Junction Transistor for the design. [5]

b. For the operational amplifier circuit in Figure 3, find the current through R_1, current through R_2, and the output voltage (v_O) in terms of input voltage (v_I). [6]

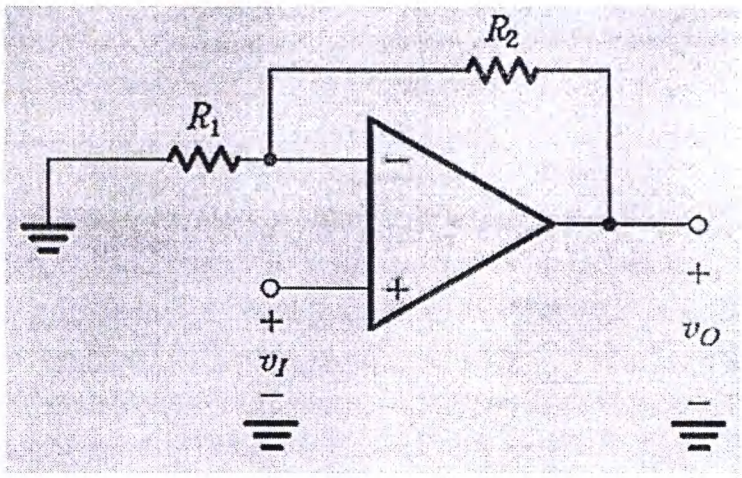

Figure: 3