KATHMANDU UNIVERSITY
End Semester Examination
February/March, 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 : 12 MAR 2019

SECTION "A"
[20 Q × 1 = 20 marks]

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

1. When R_L is _____, the output voltage in the circuit of Figure 1 is maximum.
   [a] 0 [b] R_o [c] R_s [d] ∞

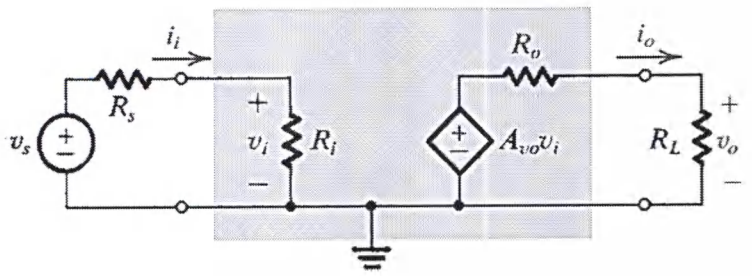

Figure: 1

2. Voltage gain of an amplifier is expressed in dB using _____ of the voltage ratio.
   [a] 10log [b] 20log [c] 30log [d] 40log

3. The output resistance of the amplifier shown in Figure 2 is _____, assuming ideal current source.
   [a] g_m [b] r_o [c] V_{DD}/I [d] 0

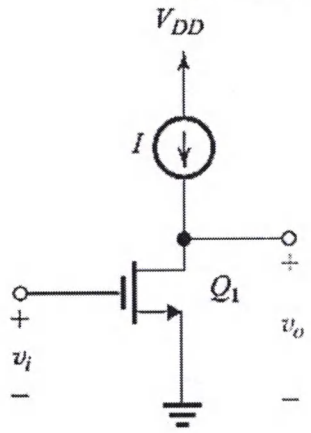

Figure: 2

4. Power gain of an amplifier must be _____.
[a] 0 [b] 1 [c] greater than 1 [d] less than 1

5. From large signal prospect, diode is _____device.
[a] exponential [b] hyperbolic [c] linear [d] parabolic

6. The _____ voltage transfer function is shown in Figure 3, where v_S is the source voltage and v_0 the output voltage.
[a] amplifier [b] half wave rectifier
[c] full wave rectifier [d] differential amplifier

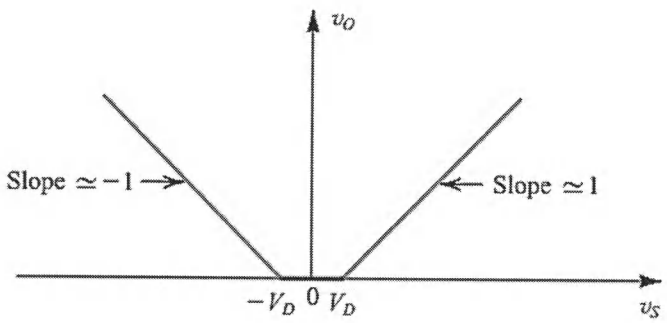

Figure: 3

7. A transistor has β_{DC} of 250 and a, base current I_B of 20μA. The collector current I_C equals_____ .
[a] 5mA [b] 500μA [c] 50mA [d] 5A

8. When transistors are used in digital circuits, they usually operate in the _____.
[a] active region [b] breakdown region
[c] linear region [d] saturation and cut-off region

9. In the circuit of Figure 4, the base current is _____.
[a] V_{CC}/R_B [b] $0.7/R_B$ [c] I_E/β [d] V_{EE}/R_E

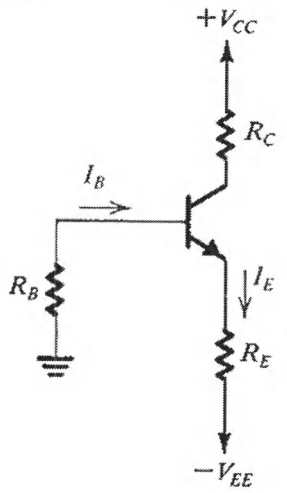

Figure: 4

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10. In the active region of operation of a BJT, emitter diode is _____ biased and collector diode is _____biased.
[a] forward, forward [b] forward, reverse
[c] reverse, forward [d] reverse, reverse

11. If early voltage (V_A) = 0 Volts in a Bipolar Junction Transistor, the value of r_o is_____.
[a] 0 Ω [b] ∞ [c] 26 Ω [d] 1 kΩ

12. MOSFET is _____control device.
[a] current [b] voltage
[c] both current and voltage [d] neither current and nor voltage

13. 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] $V_{SG}-V_t$

14. g_m of a Field Effect Transistor is _____.
[a] a bias current independent function [b] a large signal parameter function
[c] a linear function of bias current [d] a small signal parameter function

15. The maximum efficiency of class B amplifier is _____%.
[a] 25 [b] 50 [c] 78 [d] 80

16. Cross over distortion is typical problem of _____ amplifier.
[a] class A [b] class B [c] class C [d] class D

17. The circuit shown in Figure 5 is _____.
[a] an amplifier [b] a operational amplifier
[c] a differential amplifier [d] a rectifier

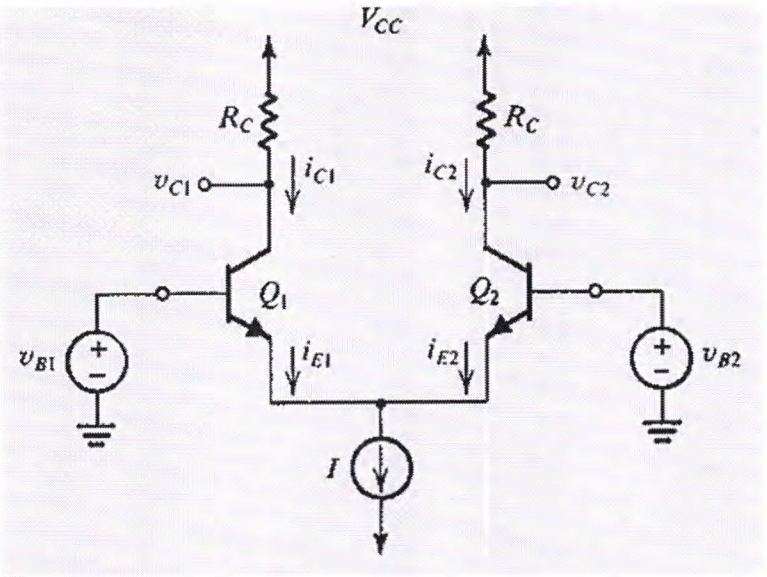

Figure: 5

18. V_O for the circuit in Figure 6 is _____.
[a] V_t [b] $V_{GS3}-V_t+V_{DD}$ [c] V_{SG3} [d] $V_{DD}-V_{SG3}$

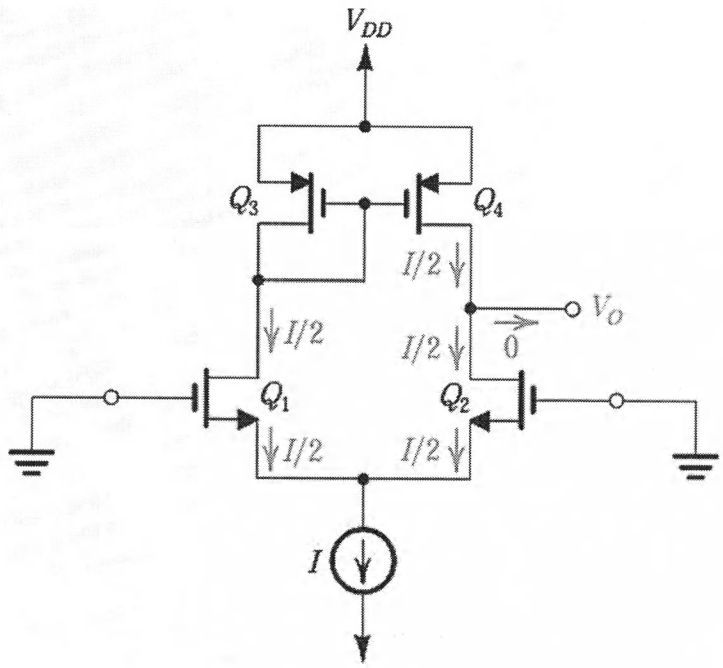

Figure: 6

19. Frequency response of an amplifier is due to the effect of _____.
[a] diode [b] resistor [c] capacitor [d] inductor

20. When a sine wave of 1 volt peak amplitude is passed through an operational amplifier of very high gain, it converts into _____.
[a] cosine wave [b] square wave [c] random wave [d] triangular wave

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SECTION "B"
[5 Q. × 11 = 55 marks]

Attempt *ANY FIVE* questions. Assume suitable data if necessary. Symbol has their usual meaning.

1.

a. Find the branch current and the potential differences across the diode and the resistor in the circuit of Figure 1. [5]

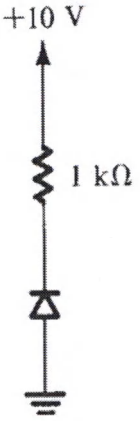

Figure: 1

b. With explanation, sketch the output for the circuit in Figure 2 when the input is a sine wave with peak to peak variation of 1V. Assume ideal diode. [6]

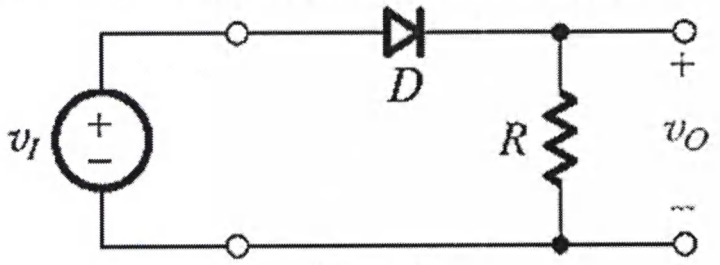

Figure: 2

2.

a. With explanation, draw emitter current (i_E) versus base to emitter potential difference (v_{BE}) and collector current (i_C) versus collector to emitter potential difference (v_{CE}) for a NPN type Bipolar Junction Transistor operating in the active region. [5]

b. Find the collector current and the emitter potential in the circuit shown in Figure 3. Assume base emitter drop as 0.7 V and $\beta = 100$. [6]

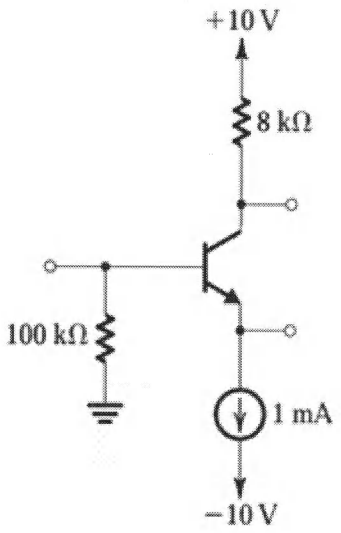

Figure: 3

3.

a. The PMOS in the circuit of Figure 4 has absolute threshold voltage of 1V, k = 0.5 mA/V^2, $I_D = 0.5$ mA, and $V_D = 3V$. Find maximum drain potential that will maintain saturation region operation. [5]

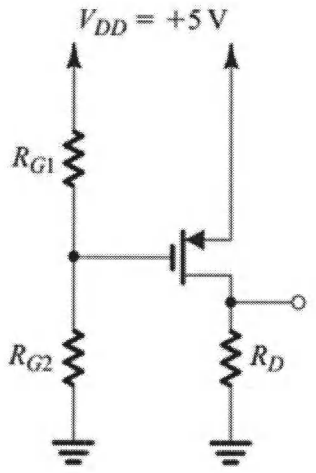

Figure: 4

b. With necessary diagram, explain cut-off region, saturation region, and triode region of a MOSFET. [6]

4.

a. Draw the small signal equivalent circuit of the MOS structure shown in Figure 5, and find the output resistance. Assume both the transistors are operating in the active region. Assume g_m and r_o of Q1 and Q2 as g_{m1}, r_{o1}, g_{m2}, and r_{o2} respectively. [5]

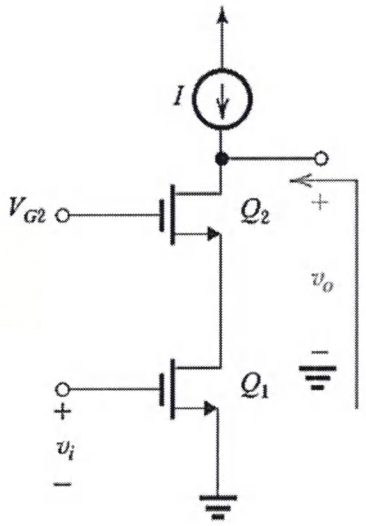

Figure: 5

b. What is frequency response of an amplfier? Explain with suitable diagram. [6]

5.

a. Draw typical circuit of class A and class B amplifiers. Show how the linearity performance of an amplifier varies with biasing. [5]

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

6.

a. Draw a circuit of a differential amplifier using MOSFET and explain its working. [5]

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

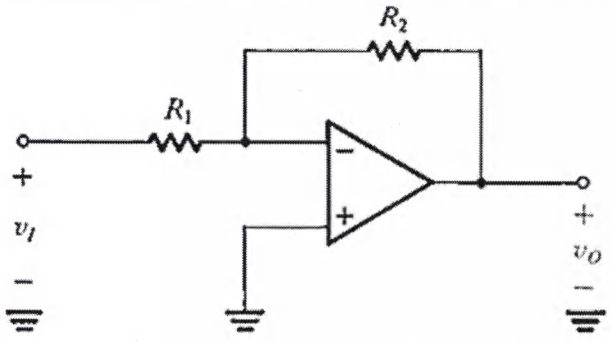

Figure: 6