KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2017

Marks Scored:

Level : B.E.
Year : II

Course : EEEG 204
Semester : I

Exam Roll No. :

Time : 30 mins.

F.M. : 20

Registration No. :

Date : MAR 27 2017

SECTION "A"

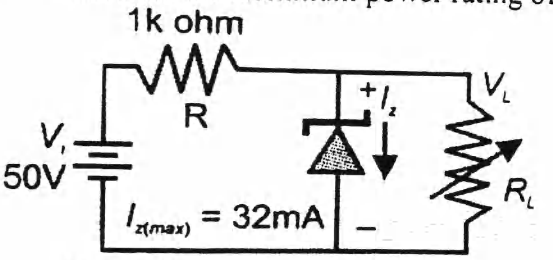
[20 Q. × 1 = 20 marks]

Choose the most appropriate option.

1. When drain-source voltage is changed by 1.5 volts, the change in drain current is of 120 μA. If the gate-source voltage remained unchanged, determine the ac drain resistance of the JFET.
   a) 2.5 kΩ b) 10.1 kΩ c) 20 kΩ d) 12.5 kΩ

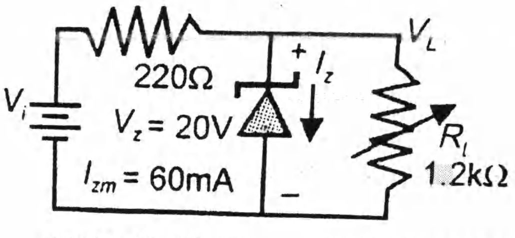
2. Since diodes are destroyed by excessive current, circuits must have:
   a) more dopants b) higher current sources
   c) current limiting resistors d) higher voltage sources

3. Calculate the maximum power rating of the diode if V_L is fixed at 10V.



   a) 64 mW b) 100 W c) 120 mW d)320 mW

4. Obtain the range of V_i to maintain the diode in the ON state in the circuit shown below.



   a) 21.5 V- 32.5V b)23.67 V- 36.87 V c) 15.1 V- 32.2V d) 19.6V- 35.6V

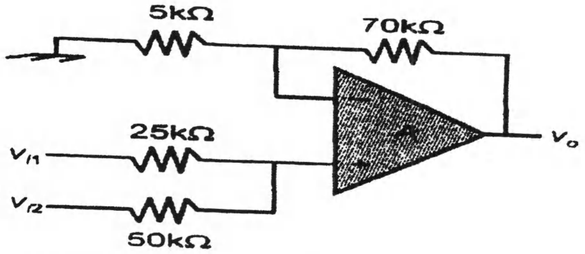
5. In an N-channel JFET, when V_{GS} is negative and V_{DS} is positive then the PN junction are
   a) forward biased b) in avalanche breakdown
   c) reverse biased d) symmetrical

6. For an N-channel JFET, I_{DSS}=8.7mA; Vp= -3V; V_{GS}= -1V. Find the value of I_D.
   a) 5 mA b) 2.333 mA c)3.866 mA d) 1.541 mA

7. Input characteristics of BJT is a plot of

a) I_E & V_{CB} b) I_E & V_{EB} c) I_B & V_{EB} d) I_C & V_{CB}

8. Obtain the output voltage V_O in the circuit shown below.



a) $2V_{i1}+7V_{i2}$ b) $10V_{i1}+3V_{i2}$ c) $10V_{i1}+5V_{i2}$ d) $5V_{i1}+2V_{i2}$

9. An N-channel JFET has a pinch-off voltage of -4.5V and I_{DSS} = 9mA.At what value of V_{GS} will I_{DS} equal to 3 mA?

a) -1.902 V b) 1.5 V c) -2 V d) 5 V

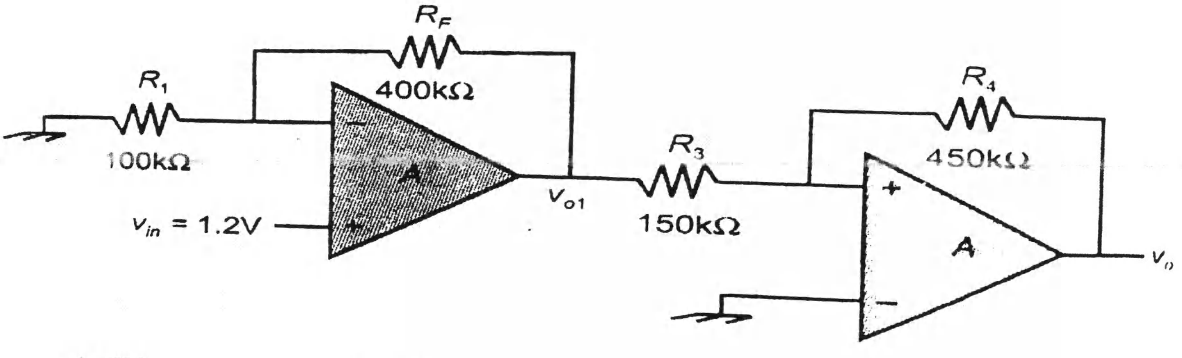
10. In a JFET the drain current changes from 1.2mA to 1.5mA when the gate to source voltage is varied from -4.25 V to -4.10 V, keeping the drain-source voltage constant. Determine the transconductance for the given JFET.

a) 10 mA/V b) 2 mA/V c) 3 mA/V d) 5 mA/V

11. I_{DSS} can be defined as:

a) the minimum possible drain current
b) the maximum possible current with V_{GS} held at –4 V
c) the maximum possible current with V_{GS} held at 0 V
d) the maximum drain current with the source shorted

12. Determine the output voltage V_O in the circuit given below.



a) -6V b) 6V c) -18V d) 12V

13. Thyristor conducts when the gate receives a current trigger, and voltage across the device is

a) not reversed
b) reverse-biased
c) beyond avalanche region
d) >0.7 v

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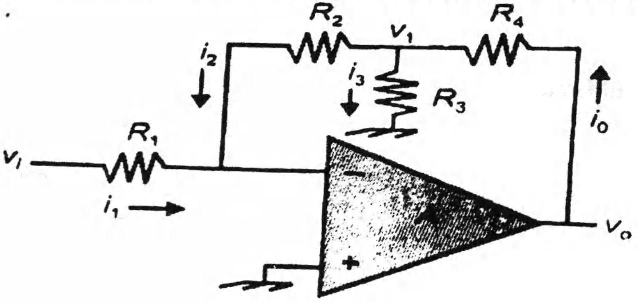
14. Transducers, in which electrical parameters i.e. resistance, inductance or capacitance changes with the change in input signal are called
a) primary transducers b) secondary transducers
c) active transducers d) passive transducers

15. For a 3 bit A/D converter, what is analog quantization size for 0-10V analog signal?
a) 0.5V b) 0.25V c) 1.25 V d) 3.25V

16. What is the range of the operating voltage level for LEDs?
a) (5–12) mV b) (1.7–3.3V) c) (5–12) V d) (20–25) V

17. Determine the voltage gain of the circuit shown below.

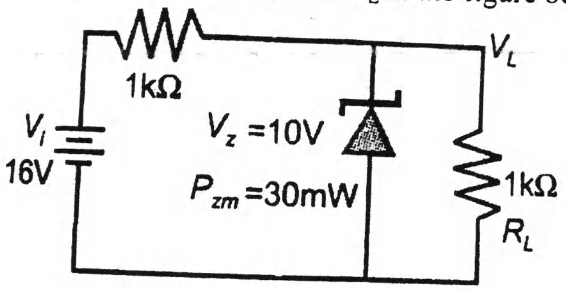


a) $-\frac{R_1}{R_2}\left\{\frac{R_4}{R_3}+\frac{R_4}{R_2}\right\}$ b) $-\frac{R_2}{R_1}\left\{1+\frac{R_4}{R_3}+\frac{R_4}{R_1}\right\}$
c) $-\frac{R_2}{R_1}\left\{1+\frac{R_4}{R_2}+\frac{R_3}{R_2}\right\}$ d) $-\frac{R_2}{R_1}\left\{1+\frac{R_4}{R_3}+\frac{R_4}{R_2}\right\}$

18. A P-N junction mimics a closed switch when it:
a) has a low junction resistance b) is reverse biased
c) cannot overcome its barrier voltage d) has a wide depletion region

19. If sampling rate is too small then acquired signal gets distorted. This defines
a) noise b) sampling error c) aliasing effect d) distortion

20. Determine the value of V_L in the figure below.



a) 2 V b) 8 V c) 5 V d) 10 V

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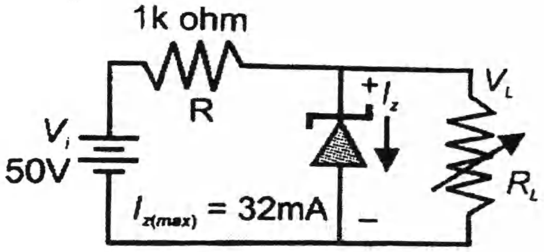
SECTION "B"

[5 Q. × 11 = 55 marks]

Attempt *ANY FIVE* questions.

1. a. Determine the range of R_L and I_L that will result in V_L to be fixed at 10V for the circuit shown below. Calculate the maximum watt rating of the zener diode. If the zener maximum watt rating is increased to 380mW, what is the new value of $I_{L(min)}$ flowing through R_L? [4]



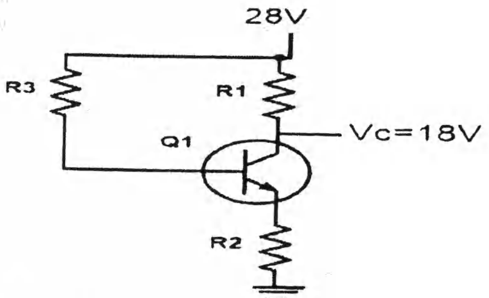
   b. Derive the DC, RMS output and efficiency of full wave rectifier. [7]

2. a. Explain the input and output characteristics of npn bipolar junction transistor with figure. [6]

   b. The secondary winding of a halfwave rectifier produces 12V, 60 Hz across 2Ω resistance. The forward biased diode resistance is 1Ω. Determine [5]
      i) Peak, rms and dc output voltages of this rectifier at no load
      ii) DC voltage when it draws full load current of 100mA
      iii) Percentage regulation of this power supply
      iv) Internal resistance of this power supply.

3. a. Define FET. Explain the operation of N-channel JFET. [6]

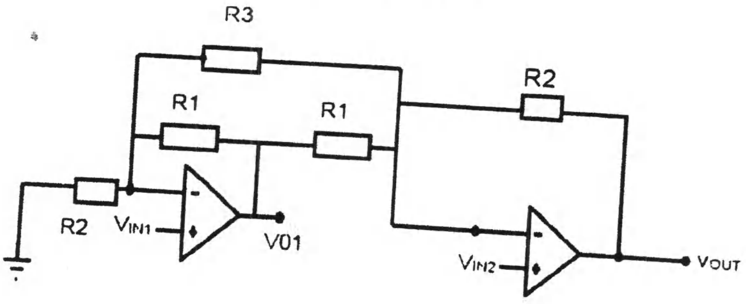
   b. The emitter bias configuration of figure below has following specifications: $I_{CQ}=0.5I_{Csat}$, $I_{Csat} = 8$ mA, $V_C=18$V and $\beta=110$. Determine the value of R_1, R_2 and R_3. [5]



4. a. Explain the operation of semi-controlled full-wave bridge rectifier. [6]

   b. Convert $(101011)_2$ using binary weighted resistor and R-2R ladder DAC. Suppose, the reference voltage is 5V. What is its V_{out} at $R_f=R_{in}/2$? [5]

5. a. Show that the output voltage V_o is proportional to the difference of the two input voltages V_{in1} and V_{in2} in the circuit given below. [5]



b. Differentiate the operation of wattmeter and energy meter with figure. [6]

6. a. Define optical transducer. Explain the different types of optical transducers in brief. [5]

b. Write short notes on:

i) Extension of instrument range using shunt [3]

ii) Difference between thermocouple and thermistor [3]