Question Paper

MANIPAL ACADEMY OF HIGHER EDUCATION

B.Tech Ist Semester Sessional Examination September 2024

BASIC ELECTRONICS [ECE 1071]

Marks: 30 **Duration: 90 mins.**

MCQ

Answer all the questions. Section Duration: 20 mins

1) At 300 K, for a diode current of 1mA, a certain germanium diode requires a forward bias of 0.1435 V, whereas a certain silicon diode requires a forward bias of 0.718 V. Under the condition stated above, the closest approximation of the ratio of reverse saturation current in germanium diode to that in silicon diode is (1)

1 | 5 | $4x10^3$ | $8x10^3$

2) A full wave rectifier has a load of 1 kΩ, the AC voltage applied to the diode is (200-0-200) V. If diode resistance is neglected, the value of average current is (1)

0.18 A | 0.16 A | 0.56 A | 0.36 A

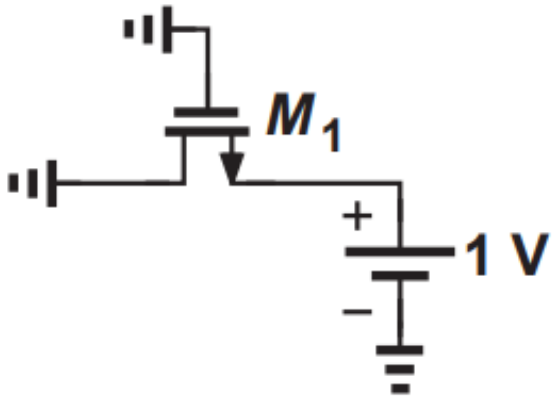
3) The photodiodes are operated in (1)

Reverse bias condition | Zero bias condition | Either of the two options mentioned in (a) and (b) | None of the two options mentioned in (a) and (b)

4) In a non-inverting OPAMP amplifier, when the feedback resistance equals the resistance connected from the inverting input to ground, the closed loop gain is (1)

1 2 Infinity Less than one

5) Find the region of operation of M1 shown in figure, if VTh = 0.4V



(1)

Cut-off region Trode region Saturation region Deep Trode region

DESCRIPTIVE

Answer all the questions.

6) Derive the Drain Current Equation for an n-channel MOSFET. If the drain-to-source voltage for an N channel MOSFET V_{DS}=0.8V. Assuming V_{th}=1.0 V, V_{GS}=3.0V and $\frac{1}{2}\mu_n C_{ox}\frac{W}{L} = 150\mu A/V^2$ (4)

Identify the region of operation of the MOSFET and Calculate the drain current I_D

7) Explain the two primary mechanisms of diode breakdown. Discuss the impact of temperature on these mechanisms and the overall diode breakdown voltage. (3)

8) A Silicon diode at room temperature (27°C) with a saturation current of 10pA has a forward current of 20.4 mA. Find the voltage applied across the diode. Take η=2 for silicon. (3)

9) A half wave rectifier with capacitor filter is supplied from transformer having peak secondary voltage 20 V and frequency 50 Hz. The load resistance is 560 Ω and capacitor used is 1000 μF. Calculate ripple factor and dc output voltage. Also draw the circuit of half wave rectifier with capacitive filter (3)

10) A 50 V dc power supply is connected through a series resistance of 1 kΩ

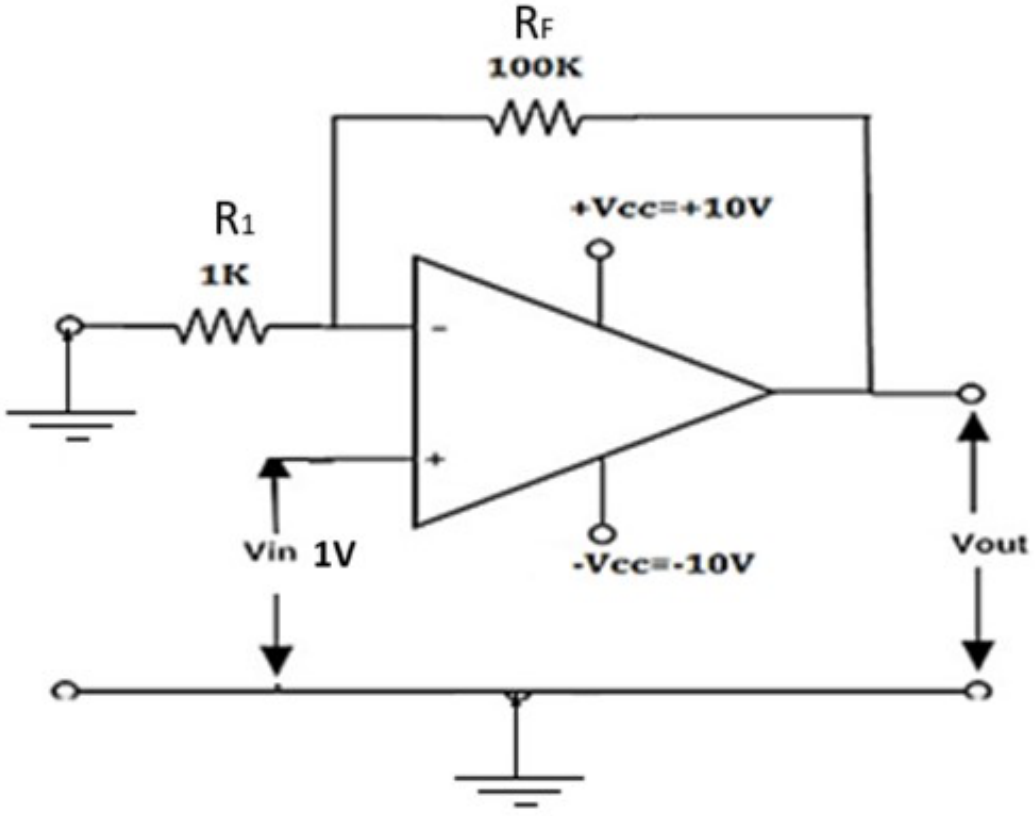
to the regulator circuit. The parameters of the Zener diode used are V_z = 10 V with I_{zmin} =1mA and power rating P_{Zmax} = 200 mW. Calculate the proper range of load resistor R_L to maintain regulation. (3)

11) For an OPAMP, when V_1 is 150 mV and V_2 is 145 mV, output voltage is 8 V. For the same OPAMP, when $V_1 = V_2 = 1$ mV, output voltage is 12 mV. Calculate the CMRR of the OPAMP in dB (3)

12) A centre-tapped FWR is supplied with 220 V, 50 Hz, AC mains through a step-down transformer with turns ratio equal to 5:1. If R_L= 500 Ω, find the average and RMS value of the load current, PIV rating of the diode used for proper working. (2)

13) With the neat circuit diagram, explain the working of full wave bridge rectifier. Derive the expressions for Average/DC value of load current and RMS value of load current. (2)

14) Derive the expression for output voltage (V_{out}) for the figure shown below. Calculate the output voltage for the given DC input voltage. (2)



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