Question Paper

MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER B.TECH. EXAMINATIONS (MIT MANIPAL) - JUNE/JULY 2022
SUBJECT : ECE 1051 - BASIC ELECTRONICS

Marks: 50   **Duration: 180 mins.**

Answer all the questions.

1A)	An AC voltage of 230V, 50Hz is applied to transformer having turns ratio 10:1. The secondary of transformer is connected to half wave rectifier. The diode has cut-in voltage 0.6V and forward resistance 10Ω. If the load resistance is 500Ω, determine the average and rms values of output current and voltage. What should be the PIV rating of the diode?	(4)
1B)	Find the static and dynamic resistances of germanium diode at 30°C for 0.2 V forward bias voltage. Assume the reverse saturation current as 1µA at 30°C.	(3)
1C)	For the Zener diode regulator, $R_S = 10Ω$, $V_Z = 10V$, $V_i = 25V$. Find the minimum and maximum current through Zener diode when the load resistance R_L is varied between 10Ω and 100Ω.	(3)
2A)	Draw the circuit diagram of RC coupled Amplifier and explain the role of each component. If the mid band gain of the amplifier is 10dB and cut-off frequencies are 1KHz and 100KHz, sketch the frequency response of amplifier indicating the bandwidth and the gain at cut-off frequencies.	(4)
2B)	For a fixed bias circuit using Si transistor, R_B = 500 KΩ, R_C = 2 KΩ, V_{CC} = 15 V, I_{CBO} = 20 µA and β = 70. Find the collector current and volatge at operating point. Take V_{BE} = 0.7 V.	(3)
2C)	A BJT has alpha (dc) 0.998 and collector-to-base reverse saturation current 1µA. If emitter current is 5mA, calculate the collector and base currents. Draw the input and output characteristics of common base configuration.	(3)
3A)	Simplify the Boolean expression using 4 variable Karnaugh Map F=Σm(0,2,5,7,8,10,13,15). Realize the simplified expression in terms of NAND gate.	(4)
3B)	Design an OP-AMP circuit , such that the output voltage is given by V_{OUT} = - (0.5V_1+0.75V_2), where V_1 and V_2 are input voltages. Choose R_F=10KΩ.	(3)
3C)	An OP-AMP has differential voltage gain of 100,000 and CMRR of 60dB. If non inverting input voltage is 150 µV and inverting input voltage is 140 µV, calculate the output voltage of OPAMP.	(3)
4A)	Draw the circuit diagram of JK flipflop using NAND gates. Write the truth table. State the differences between latches and Flipflops.	(4)
4B)	Perform $15_{(10)}$ - $31_{(10)}$ using two's complement method.	(3)
4C)	Generate (7, 4) Hamming code for the binary data '1000'. Also, write the 2421 BCD representation of decimal number 7.	(3)
5A)	An audio signal 10sin (2π1000t) volts amplitude modulates a carrier of 40sin (2π1000x10^3 t) volts. Find the modulation index, sideband frequencies, Bandwidth and amplitude of each side band components.	(4)
5B)	Given a FM signal V_{FM}(t) = 10 cos [2π10^{8}t + 5sin(2π15000t)], Calculate the carrier frequency, modulating frequency, frequency deviation and Bandwidth.	(3)
5C)	Sketch the ASK, FSK and PSK signals for the 6-bit binary data '101001'.	(3)

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