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10CS32

Third Semester B.E. Degree Examination, July/August 2021
Electronic Circuits

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Which is the suitable position of operating point for the faithful amplification? Justify your answer. **(04 Marks)**

b. Derive the operating point equation for emitter bias configuration. **(08 Marks)**

c. Sketch the gate triggering and V-I characteristics of silicon controlled rectifier (SCR). **(04 Marks)**

d. Define the thermal runaway process of transistor with typical power derating curve of silicon transistor. **(04 Marks)**

2 a. List out the difference between JFET and MOSFET. **(04 Marks)**

b. With neat sketches, explain the working of N-channel D-MOSFET. **(06 Marks)**

c. Fig. Q2 (c) shows a circuit using E-MOSFET. Given that threshold voltage for MOSFET is 2V and $I_{D(ON)} = 6\,mA$ for $V_{GS(ON)} = 5\,V$. Determine the values of operating point. **(10 Marks)**

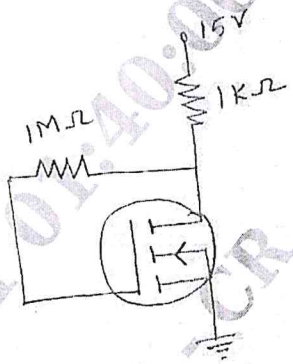

Fig. Q2 (c)

3 a. Explain the construction and working of photo transistor. Also mention its applications. **(06 Marks)**

b. Explain the working of Cathode Ray Tube (CRT) with a neat diagram. What are the advantages and disadvantages of CRT? **(07 Marks)**

c. A photodiode has a noise current of 1fA, responsivity figure of 0.5 A/W, active area of 1 mm^2 and rise time of 3.5 ns. Determine its
(i) Noise equivalent power (NEP) (ii) Detectivity (iii) D*(DEE-STAR)
(iv) Quantum efficiency at 850 nm. **(07 Marks)**

4 a. Derive the expression for current gain (A_i), input impedance (Z_i), voltage gain (A_V) and output admittance (Y_0) for a transistor amplifier using h-parameter model. **(12 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

b. Fig. Q4 (b) shows a darlington amplifier. The two transistors Q_1 and Q_2 are identical and the h-parameters for the transistors are h_{ie} = 1 KΩ, h_{fe} = 100 and $h_{oe} = 40\times10^{-6}$ mho's. The values of voltages V_{CC} = 15 V, V_{BE1} = 0.7 V and V_{BE2} = 0.7 V. Determine the following :
(i) Input impedence (ii) Output impedence (iii) Voltage gain
(iv) Current gain. **(08 Marks)**

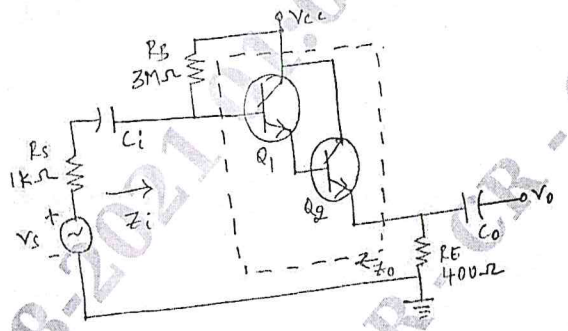

Fig. Q4 (b)

5 a. What are the advantages of negative feedback? **(05 Marks)**
b. Derive the expression for voltage gain input resistance and output resistance in a voltage serial feedback topology. **(10 Marks)**
c. Refer to the Fig. Q5 (c) of op-amp based inverting amplifier circuit. Identify the type of negative feedback. Determine the transimpedence gain, input impedence and output impedence parameters of op-amp are 100 MΩ, 10 MΩ and 100 Ω respectively. **(05 Marks)**

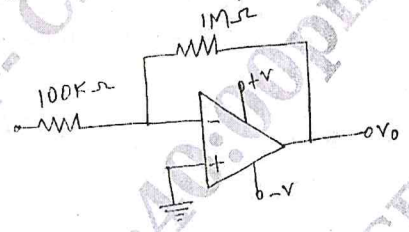

Fig. Q5 (c)

6 a. What are sinusoidal oscillators? Explain the barkhauses criterion for sustained oscillations. **(07 Marks)**
b. Explain the operation of 555 times as an Astable multivibrator. **(05 Marks)**
c. Explain the working of RC low pass and RC high pass circuits. **(08 Marks)**

7 a. Define the terms load regulation, line regulation and output resistance for a voltage regulator. **(06 Marks)**
b. Design a power transformer with a multiple output secondary and the following input and output specifications:
(i) Primary voltage : 220 V, 50 Hz
(ii) Secondary voltage : (a) 120 – 0 – 12 V at 100 mA and (b) 5 V at 1 A.
Assume B = 60,000 lines per square inch for the choosen core material and an efficiency of 90%. **(07 Marks)**
c. With a neat circuit, explain the operation of buck or step down regulator. **(07 Marks)**

8 a. Explain the working of an op-amp window comparator. **(07 Marks)**
b. Explain the working of the following :
(i) Current to voltage converters.
(ii) Voltage to current converters. **(06 Marks)**
c. Explain the working of relaxation oscillator circuit using op-amp. **(07 Marks)**

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