Third Semester B.E. Degree Examination, June/July 2019
Electronic Circuits

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1 a. Derive the mathematical expression to prove that the operating point in voltage divider bias configuration is independent of transistor gain β. **(10 Marks)**

   b. Draw the DC equivalent of the circuit shown in Fig. Q1 (b). Calculate the quiescent value of collector current using both the appropriate and the accurate method. What is the percentage error introduced using the approximate method, given that transistor gain β is 165. **(10 Marks)**
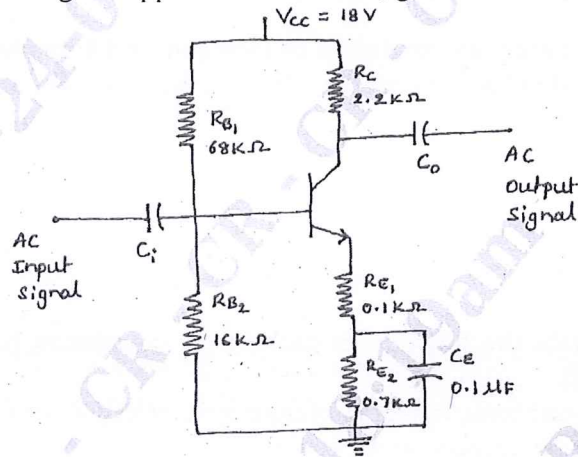

Fig. Q1 (b)

2 a. With the help of characteristic curves, explain the operating principle of Depletion MOSFET. **(10 Marks)**

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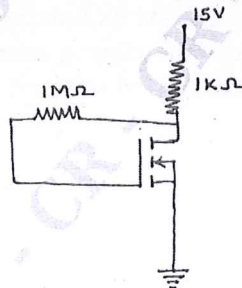

Fig. Q2 (b)

3 a. Explain the following terms:
   - (i) Noise equivalent power (NEP).
   - (ii) Illuminance.
   - (iii) Thermal noise.
   - (iv) Response time.
   - (v) Quantum efficiency   **(10 Marks)**

   b. Define an optocouplers. Explain any two optocoupler parameters that define the performance of an optocoupler. **(10 Marks)**

4 a. With the help of circuit diagram, derive an expression for current gain (A_i) of Darlington amplifier. **(10 Marks)**

   b. Explain the effect of cascading amplifier stages on the overall frequency response of the amplifier. **(10 Marks)**

PART – B

5 a. What is the significance of second order harmonic distortion in a large signal amplifiers? Derive an expression for the second harmonic distortion. **(10 Marks)**

   b. An amplifier without feedback has a voltage gain of 100. The designer decides to use 10% negative feedback to bring the non-linear distortion to an acceptable level. Determine the gain of the amplifier in the presence of feedback. If the desired value of gain with feedback is 50, what should in that case be the feedback factor? **(06 Marks)**

   c. An amplifier without feedback has a voltage gain of 50, input resistance of 1 kΩ and output resistance of 2.5 kΩ. Calculate the input resistance of the current – shunt negative feedback amplifier having a feedback factor of 0.2. **(04 Marks)**

6 a. What are the necessary conditions of loop gain and loop phase shift for sustained oscillations according to Barkhausen criterion? Why is the loop gain in practical oscillators kept slightly greater than unity? **(06 Marks)**

   b. What are crystal oscillators? What makes crystal oscillator exhibit exceptionally high frequency stability? **(06 Marks)**

   c. A quartz crystal is characterized by L = 2.5 H, R = 1 KΩ, C_S = 0.01 pF and C_M = 10 pF (pico Farad). Determine the series and parallel resonant frequencies of the crystal. **(08 Marks)**

7 a. Briefly describe the function of each of the constituent parts of a basic linearly regulated power supply. **(06 Marks)**

   b. With the help of basic circuit configurations, briefly describe the operational principle of the following switching regulator circuits:
      (i)   Buck regulator.
      (ii) Boost regulator.
      (iii) Buck-boost regulator. **(12 Marks)**

   c. Compare linear and switch mode power supplies. **(02 Marks)**

8 a. What is an absolute value circuit? Draw the circuit schematic of one such circuit configured around op-amp and briefly describe its functional principle. **(10 Marks)**

   b. What is the main advantage of using a comparator with hysteresis over a conventional comparator? Explain with the help of relevant transfer characteristics. **(10 Marks)**

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