B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E.   Semester: III
Branch: ES Cluster (EEE/TCE/ECE/EIE/MD)   Duration: 3 hrs.
Course Code: 19ES3CCAEC   Max Marks: 100
Course: Analog Electronic Circuits   Date: 13.09.2023

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
                        2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) For the circuit shown in Fig.1, determine the transfer characteristics and   **06**
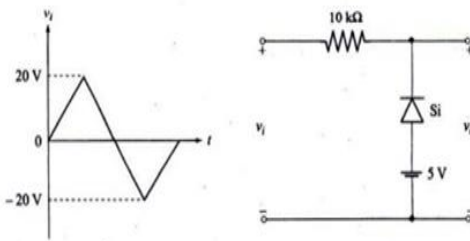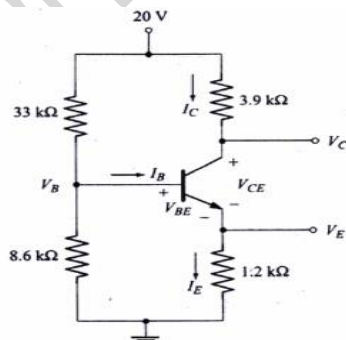   sketch the output waveform.

Fig.1

   b) For the voltage divider configuration shown below , Use approximate analysis   **07**
       and calculate

       a)V_B
       b)I_C and I_B
       c) V_E and $V_{CE.}$ Assume silicon transistor with β =110
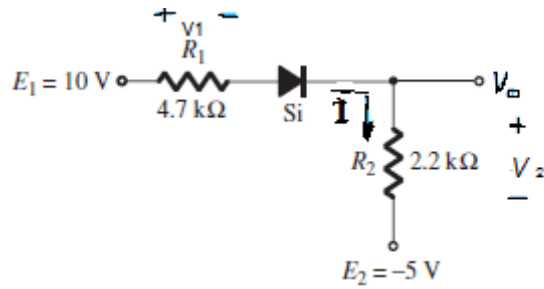

   c) Derive the equations for voltage gain , current gain, input impedance and   **07**
       output impedance for a CE ,Voltage divider configuration using r_e model
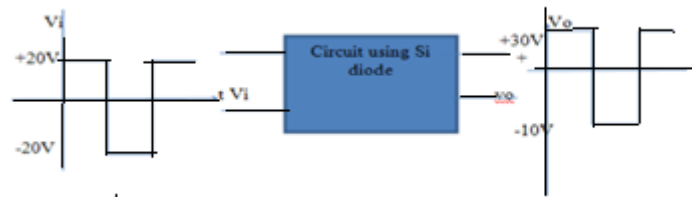
OR

2   a)   Determine I, V_1, V_2, and V_o for the series dc configuration shown   04

b)   Design a suitable circuit for the block shown below which has input and output   05
waveforms as indicated

c)   Derive an equation for I_B and V_{CE} for a voltage divider Bias using exact   05
analysis.

d)   For the network of Fig. 2, determine: 06

    a. r_e, b. Z_i,   c. Z_o ($r_o = \infty \Omega$).   ,   d. A_v ($r_o = \infty \Omega$).
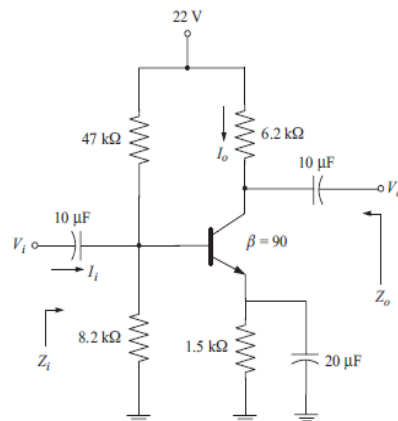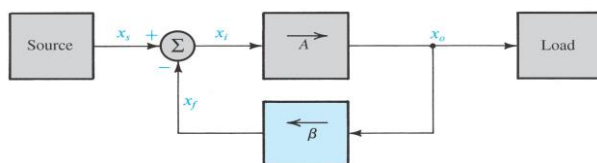

Fig.2

UNIT - II

3   a)   Derive equation for Miller effect induced input and output capacitance for an   06
inverting amplifier

b)   Identify the amplifier shown and enumerate its properties,   09

c) Calculate gain, feedback factor, gain with feedback and voltage gain with feedback for the circuit shown in Fig 3 **05**
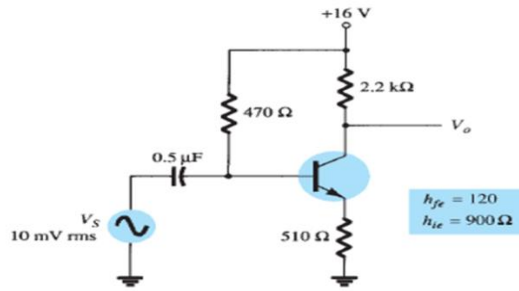

Fig3

UNIT - III

4   a) With a neat circuit diagram, waveforms, explain the working of complementary symmetry class B amplifier. Also, Derive an expression for conversion efficiency. **08**

b) For a class B amplifier providing a 20V peak signal to a 16Ω load speaker and a power supply of $V_{cc} = 30V$, determine the input power, output power and circuit efficiency. **06**

c) For a harmonic distortion reading of $D_2 = 0.1$, $D_3 = 0.02$, and $D_4 = 0.01$, with $I_1 = 4$ A and $R_C = 8$ Ω, calculate the total harmonic distortion, fundamental power component, and total power. **06**

UNIT - IV

5   a) Derive an expression for i_D when the n-channel e-MOSFET operates in **07**

(a)Triode region.
(b)Saturation region

b) Use the expression for operation in the triode region to show that n channel MOSFET operated with an override voltage $V_{ov}=V_{GS}-V_t$ and having a small V_{DS} across it behaves approximately as a linear resistance r_{DS} . Calculate the value of r_{DS}obtained for a device having kn'=$100\mu A/v^2$ and w/L= 10 when operated with an overdrive voltage of 0.5V **05**

c) Discuss the different methods of biasing a N channel enhancement MOSFET. **08**

UNIT - V

6   a) Derive an expression for transconductance and voltage gain for small signal operation of the enhancement MOSFET amplifier **06**

b) Derive expression for input resistance, output resistance, voltage gain and overall voltage gain of a common gate MOSFET amplifier **08**

c) Explain with equations the basic MOSFET as current source. **06**

OR

7   a)   Obtain the three different relationships for determining g_m of a MOSFET   **06**

     b)   Derive expression for input resistance, output resistance, voltage gain and overall voltage gain of a common source MOSFET amplifier   **08**

     c)   Discuss the Wilson MOS mirror with neat circuit and relevant equations. .   **06**

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