Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 27186

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Third Semester

Electrical and Electronics Engineering

EC 6202 — ELECTRONIC DEVICES AND CIRCUITS

(Common to Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Robotics and Automation Engineering, Biomedical Engineering, and Medical Electronics)

(Also Common to Second Semester for Biomedical Engineering and Medical Electronics)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw the symbol of the following devices.
   (a) PN diode
   (b) Zener diode
   (c) LED
   (d) UJT.
2. Calculate the diffusion Capacitance for a silicon diode with a 15 mA forward current, if the charge carrier transit time is 70nsec.
3. Calculate I_C and I_E for a transistor that has α_{dc} = 0.99 and I_B = 150 μA. Determine the value of β_{dc} for the transistor.
4. Show how an SCR can be triggered on by the application of a pulse to the gate terminal.
5. Draw the small signal equivalent circuit of a CS JFET.
6. What is the need of coupling capacitors in amplifier design?
7. Define CMRR. What is its ideal value?
8. What is the need for neutralization?

9. Mention the advantages of negative feedback circuits.

10. What is the advantage of a Colpitts oscillator compared to a phase shift oscillator?

PART B — (5 × 16 = 80 marks)

11. (a) (i) With necessary diagrams, explain the forward and reverse characteristics of PN junction diode. (8)

(ii) Draw the circuit diagram of a half wave rectifier for producing a positive output voltage. Explain the circuit operation and sketch the waveforms. (8)

Or

(b) With neat diagram, explain the operation of Zener diode and its forward and reverse characteristics. Also distinguish between Avalanche and Zener Break downs. (16)

12. (a) (i) Explain the selection of Q point for a transistor bias circuit and discuss the limitations on the output voltage swing. (8)

(ii) Draw the cross section diagram for an N type enhancement mode MOSFET. Briefly explain its operation. (8)

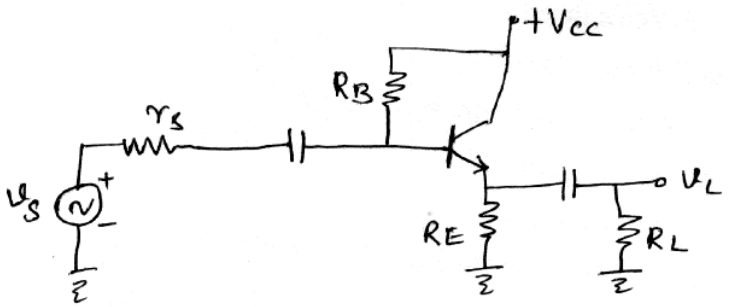
Or

(b) (i) Draw the basic construction and equivalent circuit of a Uni Junction Transistor. Briefly explain the device operation. (8)

(ii) Sketch the four layer construction of an SCR and the two transistor equivalent circuit Explain the device operation. (8)

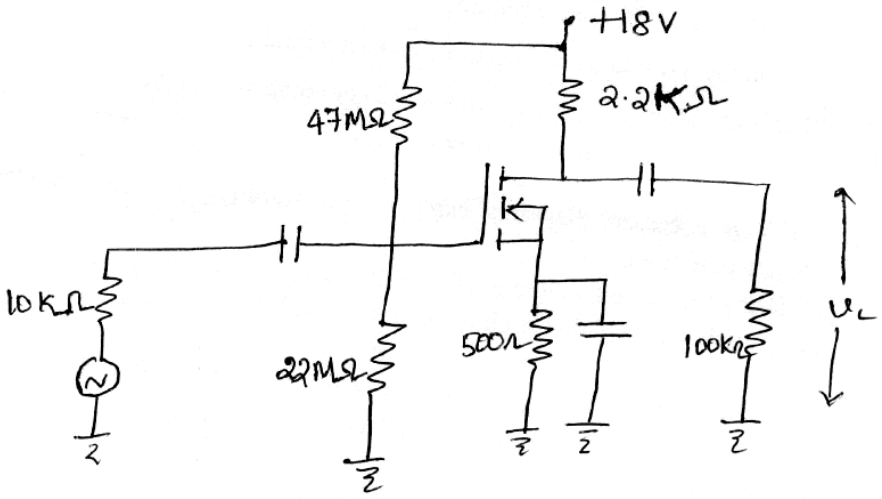
13. (a) (i) Discuss the factors involved in the selection of I_C, R_C and R_E for a single stage common emitter BJT amplifier circuit, using voltage divider bias. (8)

(ii) A CC amplifier shown in below figure has V_{CC} = 15 V, R_B = 75$k\Omega$ and R_E = 910Ω The β of the silicon transistor is 100 and the load resistor is 600Ω Find r_{in} and A_v. (8)



Or

(b) (i) The MOSFET shown in below figure has the following parameters. $V_T = 2$ V, $\beta = 0.5 \times 10^{-3}$, $r_D = 75k\Omega$ It is biased at $I_D = 1.93$mA Determine the input impedance and voltage gain. (8)



(ii) With neat circuit diagram, perform ac analysis for common source using equivalent circuit NMOSFET amplifier. (8)

14. (a) With neat sketch, explain the BJT differential amplifier with active load and derive for Ad, Ac and CMRR. How CMRR can be improved. (16)

Or

(b) (i) Explain with circuit diagram class B power amplifier and derive for its efficiency. (8)

(ii) With neat circuit, explain and derive the gain and Band width of a single tuned amplifier. (8)

15. (a) Sketch the circuit diagram of a two-stage capacitor coupled BJT amplifier that uses series voltage negative feedback. Briefly explain how the feed back operates.

Or

(b) Describe and explain the operation of the following oscillators.

(i) Wien bridge oscillator (5)

(ii) Design a Wien bridge oscillator circuit to oscillate at a frequency of 20 kHz. (5)

(iii) Crystel oscillator. (6)

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Question Paper Code : 57278

B.E/B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Third Semester

Electrical and Electronics Engineering

EC 6202 – ELECTRONIC DEVICES AND CIRCUITS

(Common to Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Robotics and Automation Engineering & Second Semester BPO Medical Engineering)

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Define diode-resistance.
2. Mention the applications of diode.
3. Differentiate between JFET and MOSFET.
4. Draw the transfer and drain characteristic curves of JFET.
5. Draw the small signal model of BJT device.
6. Differentiate between power transistor and signal transistor.
7. Define CMRR. How to improve it ?
8. Compare the characteristics of CE, CB and CC amplifiers.
9. List-out the advantages of negative feedback.
10. Define Barkhausen's criteria.

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Explain the VI characteristics of PN junction diode. **(8)**

(ii) Explain the VI characteristics of Zener diode. **(8)**

OR

(b) Briefly discuss the following terms :

(i) Transition and diffusion capacitance

(ii) Temperature effect of PN junction

(iii) Laser Diode **(6 + 5 + 5)**

12. (a) (i) For an n-channel silicon FET with a = 3×10^{-4} cm and Nd = 10^{15} electrons/cm^{-3}. Find (a) the pinch off voltage and (b) the channel half-width for $V_{GS} = 0.5\ V_P$. **(6)**

(ii) Elaborately discuss the drain current characteristics and transfer characteristics of MOSFET. **(10)**

OR

(b) (i) Elaborately discuss the structure and characteristics of the IGBT. **(8)**

(ii) Explain the operation of the UJT. **(8)**

13. (a) (i) Determine the voltage gain and input impedance of common-base amplifier. **(8)**

(ii) Determine the mid band gain, upper Cutoff frequency of a Common-Source amplifier fed with the signal having internal resistance Rsig = 100 kΩ (Figure 13(a) (ii)). The amplifier has $R_G = 4.7$ MΩ, $R_D = R_L = 15$ kΩ, gm = 1 mA/V, ro = 150 kΩ, Cgs = 1 pF and Cgd = 0.4 pF. **(8)**

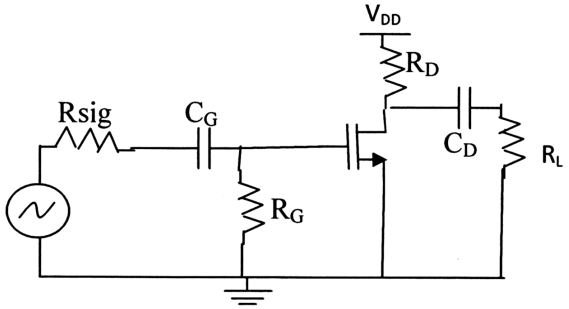

Figure 13(a) (ii)

OR

(b) Determine the mid-band gain and bandwidth of a CE amplifier (shown in Figure 13(b)) Assume lower cutoff frequency is 100 Hz. Let hfe = β = 100, cbe = 4pF, cbc = 0.2PF and $V_A = \infty$. **(16)**

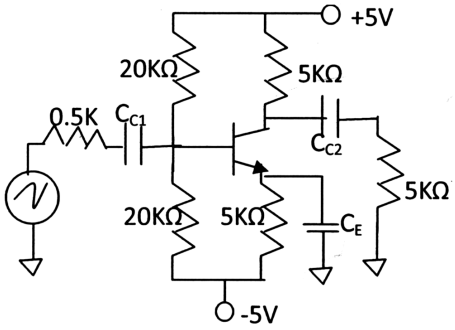

Figure 13(b)

14. (a) (i) Explain single tuned amplifier and derive for gain, resonant frequency and cutoff frequencies. **(12)**

(ii) Briefly explain Hazeltine neutralization used in tuned amplifier for stabilization. **(4)**

OR

(b) Explain the common mode and differential mode operation of the differential amplifier. **(16)**

15. (a) (i) Identify the nature of feedback in Figure 15(a) (i). Let R_{C1} = 3 kΩ, R_{C2} = 500 Ω, R_E = 50 Ω, R_S = R_F = 1.2 kΩ, hfe = 50, hie = 1.1 kΩ, hre = hoe = 0. Determine overall voltage gain (Avf), overall current gain (Aif), input impedance (Rif) and output impedance (Rof). **(16)**

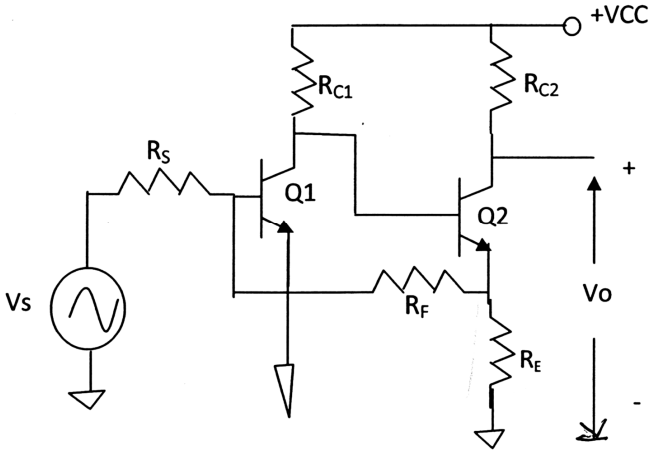

Figure 15(a) (i)

OR

(b) (i) Draw and explain the RC-phase Shift oscillator using BJT and also derive the condition for Oscillation. **(12)**

(ii) In Colpitt's Oscillator C1 = 1nF and C2 = 100 nF. If the frequency of oscillation is 100 kHz find the value of inductor. Also find the minimum gain required for obtaining sustained oscillations. **(4)**

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Question Paper Code : 71723

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Second/Third Semester

Electrical and Electronics Engineering

EC 6202 — ELECTRONIC DEVICES AND CIRCUITS

(Common to Biomedical Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Medical Electronics Engineering, Robotics and Automation Engineering)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate between zener breakdown and avalanche breakdown.

2. Mention some of the applications of laser diode.

3. Draw the two transistor equivalent circuit of SCR.

4. A transistor has a typical β of 100. If the collector current is 40 mA, what is the value of emitter current?

5. A common emitter amplifier has an input resistance 2.5 $k\Omega$ and voltage gain of 200. If the input signal voltage is 5mV. Find the base current of the amplifier.

6. Define an intrinsic stand off ratio of UJT and draw its equivalent circuit.

7. Compare the performances of CE and CC configuration.

8. Define a common mode rejection ratio for a differential amplifier. What is the value of CMRR for ideal cases?

9. A tuned circuit has a resonant frequency of 1600 kHz and a bandwidth of 10 kHz. What is the value of its Q factor?

10. Give the two Barkhausen conditions required for sinusoidal oscillation to be sustained.

PART B — (5 × 13 = 65 marks)

11. (a) Draw the circuit diagram and explain the working of full wave bridge rectifier with output filter and derive the expression of average output current and ripple factor. (13)

Or

(b) (i) Drive the expression for diffusion capacitance of PN junction diode. (7)

(ii) Explain how zener diode can be acts as a voltage regulator. (6)

12. (a) (i) Explain the drain and transfer characteristics of Enhancement type MOSFET. (7)

(ii) Describe the working of Silicon controlled rectifier with neat diagram. (6)

Or

(b) (i) Describe the construction and working of IGBT with neat diagram. (7)

(ii) Sketch and explain the typical shape of drain characteristics of JFET for $V_{GS} = 0$ with indication of four region clearly. (6)

13. (a) Draw the circuit diagram of a common drain MOSFET amplifier. Derive the expression for its voltage gain, input resistance and output resistance. (13)

Or

(b) Figure 13(b) shows a common-emitter amplifier. Determine the input resistance, ac load resistance, voltage gain and output voltage. (13)

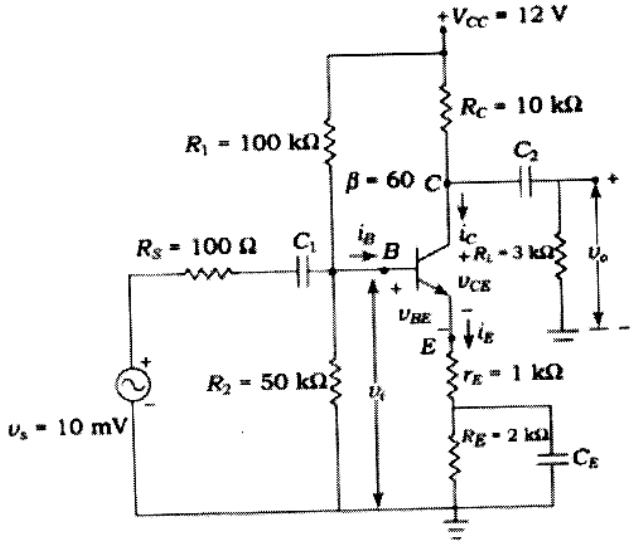

Figure 13(b)

14. (a) Draw the circuit diagram and explain the working of a differential amplifier using FET. Derive the expression for differential mode gain and common mode gain. (13)

Or

(b) Describe the working of class A and class C power amplifier in details with relevant diagrams. (13)

15. (a) With a neat block diagram, explain the operation of following feedback amplifiers.

(i) Voltage series feedback amplifier (7)

(ii) Current shunt feedback amplifier. (6)

Or

(b) Explain with neat circuit diagram, the working of Hartley oscillator using transistor. Derive an expression for frequency of oscillation. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Design an oscillator to operate at a frequency of 10 kHz which gives an extremely pure sine wave output, good frequency stability and highly stabilized amplitude. Discuss the operation of this oscillator as an audio signal generators. (15)

Or

(b) Design a voltage divider bias circuit for transistor to establish the quiescent point at V_{CE} = 12 V, I_C =1.5 mA, stability factor $S \leq 3$, $\beta = 50$, V_{BE} = 0.7 V, V_{CC} = 22.5 V and R_C = 5.6 kΩ. (15)

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Question Paper Code : 77110

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Third Semester

Electrical and Electronics Engineering

EC 6202 – ELECTRONIC DEVICES AND CIRCUITS

(Common to Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Robotics and Automation Engineering)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is diffusion capacitance of PN junction diode?

2. What is a rectifier? Name it's types.

3. Write any two points of comparison between JFET with BJT.

4. What is a thyristor? Mention two of them.

5. Draw the hybrid model of BJT in CE configuration.

6. What are amplifiers? Write it's uses.

7. What are cascaded amplifiers?

8. Draw the ideal tuned circuit and write the expression for it's resonant frequency.

9. Write the disadvantages of negative feedback in amplifiers and how it can be overcome?

10. What is the expression for the frequency of oscillations of a wein-bridge oscillator?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the action of a full-wave rectifier using diodes and give waveforms of input and output voltages. (8)

(ii) Derive an expression for a ripple factor in a full-wave rectifier with resistive load. (8)

Or

(b) Briefly discuss about the following :

(i) Laser diodes.

(ii) Zener diode as a voltage regulator. (8 + 8)

12. (a) With the help of suitable diagram, explain the working of enhancement MOSFET. (16)

Or

(b) Describe the construction and working of UJT with it's equivalent circuit and V-I characteristics. (16)

13. (a) Draw the h-parameter model of a BJT-CE amplifier and derive the equations for voltage gain, current gain, input impedance and output impedance. (16)

Or

(b) Describe about small signal MOSFET amplifiers (NMOS) and obtain the expression for it's transconductance. (16)

14. (a) Draw the circuit of emitter coupled BJT differential amplifier, and derive expressions for differential gain, common mode gain and CMRR. (16)

Or

(b) What is Neutralization? Explain any one method in brief. (16)

15. (a) Draw circuit of CE amplifier with current series feedback and obtain the expression for feedback ratio, voltage gain, input and output resistances. (16)

Or

(b) Explain the operation of Colpitts oscillator with neat circuit diagram. Also derive the expressions for the frequency of oscillation and the condition for maintenance of oscillation. (16)

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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 77324

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Second Semester

Biomedical Engineering

EC 6202 — ELECTRONIC DEVICES AND CIRCUITS

(Common to Medical Electronics)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write down the equation for diode current.
2. Differentiate Zener breakdown and Avalanche breakdown.
3. For a JFET, given the transconductance = 2mA/V and drain resistance = 6K, determine its amplification factor.
4. What is latching current?
5. If h_{fe} = 50, h_{ie} = 1.1K, find the equivalent h_{fc} and h_{ic} for a BJT.
6. Draw the small signal model of MOSFET. Give the expressions for the small signal parameters.
7. Name the various types of coupling used in cascaded amplifiers.
8. Compare the power conversion efficiency of class A and class B amplifiers.
9. Show how the input and output resistances change due to feedback in a voltage series feedback amplifier.
10. Define gain margin.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the forward and reverse characteristics of a PN junction diode. Discuss its application as half wave rectifier and derive its DC output voltage. (10)

(ii) Discuss the features and applications of laser diodes. (6)

Or

(b) (i) Describe the construction and characteristics of a Zener diode. Explain its important application with relevant circuit diagram. (10)

(ii) Discuss the significance of the two types of capacitance in PN junction diodes. (6)

12. (a) (i) With a neat circuit diagram, derive the DC equations for a BJT with voltage divider bias. Draw its input and output characteristics and DC load line. (10)

(ii) Explain the V-I characteristics of UJT and hence derive its intrinsic standoff ratio. (6)

Or

(b) (i) With a neat circuit diagram, derive the DC equations for JFET with drain feedback bias. Draw its characteristics and hence derive the expression for its amplification factor. (10)

(ii) Describe the operation of SCR using its two transistor model. (6)

13. (a) Describe the low-frequency and high-frequency response of BJT amplifier. Derive the expressions for the various low and high cut-off frequencies. Roughly sketch the typical frequency response curve and determine the bandwidth, Q factor and cut-off frequencies. (16)

Or

(b) A 100 mV signal with 500 ohms source resistance is applied to a voltage divider biased BJT circuit with the following specifications: R_1=100K, R_2=47K, R_c=5.6K, R_E=5.6K, V_{cc}=18V, h_{ie}=1.5K, h_{fe}=100. A load resistance of 33K is ac coupled to the collector. Find the voltage across the load resistance if the input is given to (i) the base of the circuit (ii) the emitter of the circuit. (16)

14. (a) (i) Explain the operation of a Class B amplifier with neat diagram. Derive the expression for its maximum efficiency. Mention its drawback and the methods to overcome it. (10)

(ii) Explain briefly the Hazeltine method of neutralization in tuned amplifiers. (6)

Or

(b) (i) Discuss the common mode and difference mode operations of a BJT based differential amplifier circuit and derive the expression for its CMRR. (10)

(ii) Show how the performance of an amplifier can be improved using an FET input stage. (6)

15. (a) (i) State the advantages of negative feedback. Discuss the current shunt feedback amplifier in detail and derive its voltage and current gain. (10)

(ii) Determine the change in the gain and input resistance for a voltage series feedback amplifier if its open loop values are gain = 20, input resistance = 1.5K. Take feedback factor as 0.02. (6)

Or

(b) (i) Derive the condition for sustained oscillation. Explain the Hartley oscillator in detail and derive the expression for its frequency of oscillation. (10)

(ii) Design a Wien bridge oscillator circuit for a frequency of 4 kHz. (6)

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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80331

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Third Semester

Electrical and Electronics Engineering

EC 6202 — ELECTRONIC DEVICES AND CIRCUITS

(Common to Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Robotics and Automation Engineering and Second Semester Biomedical Engineering, Medical Electronics)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State few applications of zener diode.
2. A silicon diode has a saturation current 7.5 μA at room temperature 300k. Find the saturation current at 400k.
3. Define Early effect.
4. Determine the base current for the CE transistor circuit if Ic = 80 mA and β = 170.
5. State Miller's Theorem.
6. Draw the hybrid small signal model of CB configuration.
7. CMRR of an amplifier is 100 dB, calculate common mode gain, if the differential gain is 1000.
8. Define conversion efficiency of power amplifier.
9. Differentiate oscillator and amplifier.
10. State the Barkhausen criterion for an oscillator.

PART B — (5 × 13 = 65 marks)

11. (a) Derive the expression of the Space charge or Transition capacitance of PN diode under reverse bias with a neat diagram. (13)

Or

(b) Explain the operation of a Half wave rectifier and derive its various parameters. (13)

12. (a) Draw and explain the working of SCR and its V-I characteristics. (13)

Or

(b) Describe the operation of UJT as a relaxation oscillator and derive its frequency of oscillation. (13)

13. (a) Determine the input impedance, output impedance, voltage gain and current gain of CE amplifier using hybrid model.

Or

(b) Explain the Common Drain MOSFET amplifier and derive its input impedance, output impedance and voltage gain. (13)

14. (a) Explain the common mode and differential mode analysis of differential amplifier and derive its CMRR. (13)

Or

(b) What is Neutralization? Explain any two methods of Neutralization. (13)

15. (a) Briefly explain Voltage – series feedback amplifier with neat diagram and derive an expression for input and output resistance. (13)

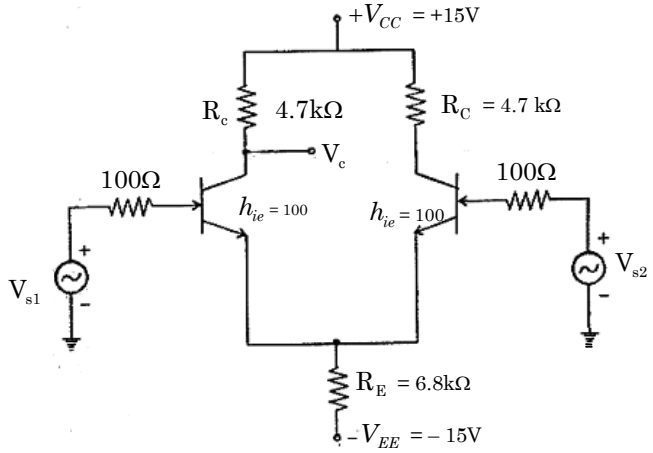
Or

(b) With neat diagram explain Wien - Bridge Oscillator and derive an expression for frequency of oscillation. (13)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Design a RC phase shift oscillator to generate 5 kHz sine wave with 20 V peak to peak amplitude. Assume hfe = β = 150, C =1.5nF, hre =1.2 kΩ. (5)

(ii) Evaluate the (1) operating point (2) differential gain (3) common mode gain (4) CMRR and (5) output voltage if V_{S1} = 70 mV peak to peak at 1 kHz and V_{S2} = 40 mV peak to peak at 1 kHz of dual input balanced output differential Amplifier, $h_{ie} = 2.8\,K\Omega$. (10)



Or

(b) Evaluate the $A_i, A_v, R_i, R_o, A_{is}, A_{vs}$ of a single stage CE amplifier with $R_s = 1\,k\Omega$, $R_1 = 22\,k\Omega$, $R_2 = 10\,k\Omega$, $R_C = 2\,k\Omega$, $R_L = 2\,k\Omega$, $h_{fe} = 50$, hie $= 1.1\,k\Omega$, $h_{oe} = 25\,\mu\,A/V$ and $h_{re} = 2.5*10-4$. (15)