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0200ECT202052401



Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

B.Tech Degree S4 (R,S) / S4 (WP) (R) / S2 (PT) (S, FE) Examination May 2024 (2019 Scheme)

**Course Code: ECT202**

**Course Name: ANALOG CIRCUITS**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*(Answer all questions; each question carries 3 marks)*

Marks

- |    |   |   |
|----|---|---|
| 1  | Draw the output of a simple positive clamper circuit when input is 1kHz square wave with +5V and -10V amplitude.                  | 3 |
| 2  | Design a Differentiator to differentiate +5 V pulse and +5 V square wave with 3kHz frequency. Draw the input and output waveform. | 3 |
| 3  | Draw the mid-frequency hybrid $\pi$ ac equivalent circuit model of BJT and define parameters.                                     | 3 |
| 4  | Define Miller's theorem and discuss its significance on high frequency performance of amplifiers.                                 | 3 |
| 5  | Mention the region in which MOSFET acts as an amplifier? How will you ensure that MOSFET is biased in that region?                | 3 |
| 6  | In IC, Common source amplifier with diode connected load is preferred instead of resistive load. Justify the statement.           | 3 |
| 7  | Deduce the expression for closed loop gain ( $A_f$ ) of Negative feedback Amplifier.  | 3 |
| 8  | Crystal Oscillator provides good frequency stability. Justify the statement.  | 3 |
| 9  | Design a short-circuit current limiting circuit to limit $I_{L,max}=3A$ .   | 3 |
| 10 | Discuss about the cross over distortion in power amplifiers. How can it be eliminated?  | 3 |

**PART B**

*(Answer one full question from each module, each question carries 14 marks)*

**Module -1**

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|----|---|---|
| 11 | a) Explain the working of Slicer circuit. Design a slicer circuit to clip sine wave at +3V and +6V clipping level. Draw the transfer characteristics. | 7 |
|    | b) Derive the design equation of RC Integrator. Show that output voltage is directly proportional to the integral of input voltage.                   | 7 |

- 12 a) In an amplifier which uses fixed bias, the transistor is operating at  $V_{CE}=3\text{ V}$  and  $I_C=1.5\text{ mA}$ . The  $\beta$  of the transistor is 150 and Supply voltage,  $V_{CC}=6\text{ V}$ . Design for  $R_B$  and  $R_C$ . Draw the load line and mark the Q point. If the transistor is replaced with a new one with  $\beta=200$ , Obtain the new operating point. Assume  $V_{BE}=0.7\text{ V}$ .. 8
- b) Draw the RC Coupled amplifier circuit and discuss the function of each components in the circuit. 6

**Module -2**

- 13 a) Derive small signal voltage gain, input and output resistance of CE RC coupled amplifier at midfrequency. 8
- b) Why the voltage gain of RC coupled amplifier falls at low and high frequencies? 6
- 14 a) Design an RC coupled amplifier with  $A_v=30$ . 9  
Let  $V_{CC}=12\text{ V}$ ,  $I_{CQ}=2\text{ mA}$ ,  $\beta_{dc}=250$ . Choose Si Transistor.
- b) Distinguish between DC and AC load line 5

**Module -3**

- 15 a) Derive the small signal voltage gain, input and output resistance of Common source amplifier with diode connected load. 7
- b) In an Enhancement MOSFET Drain feedback bias circuit, MOSFET threshold voltage ( $V_T$ )= $2\text{ V}$ ,  $I_{D(ON)}=6\text{ mA}$  for  $V_{GS(ON)}=5\text{ V}$ ,  $R_D=1\text{ K}\Omega$ ,  $R_G=1.5\text{ M}\Omega$ ,  $V_{DD}=15\text{ V}$ . Determine the value of operating point. 7
- 16 a) What are the effects of cascading in gain and bandwidth of Amplifier. With relevant equations explain the effects. 7
- b) Design two stage cascade amplifier with overall voltage gain=900. Let  $V_{CC}=12\text{ V}$ ,  $I_{CQ}=2\text{ mA}$ ,  $\beta_{dc}=250$ , Choose Si Transistor. 7

**Module -4**

- 17 a) Discuss the working principle of LC oscillators. 5
- b) Deduce the expression for frequency of oscillation of Wien Bridge Oscillator. 9
- 18 a) Show that negative feedback amplifier provides stability in gain when compared to basic amplifier (without feedback). 7
- b) Draw the circuit diagram of Voltage shunt feedback amplifier and Voltage series feedback amplifier, each circuit deduce the expression for feedback factor( $\beta$ ). 7

**Module -5**

- 19 a) Explain the working of current boosting circuit. Draw the circuit diagram of series voltage regulator with current boosting circuit. 9
- b) Draw the circuit diagram of +5V, 500mA Regulated DC Power supply. 5
- 20 a) Draw the circuit of complementary symmetry class B push pull power amplifier and explain its operation. What are the advantages of complementary symmetry amplifiers when used at output stages? 8
- b) What do you mean by Harmonic distortion? Define Second Harmonic distortion and Total Harmonic distortion (THD). 6

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