C 0800RAT203122103 Pages: 3

Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Third Semester B.Tech Degree Regular and Supplementary Examination December 2023 (2019 Scheme)

**Course Code: RAT203**

**Course Name: ELECTRONIC DEVICES AND CIRCUITS**

Max. Marks: 100 Duration: 3 Hours

**PART A**

***Answer all questions. Each question carries 3 marks*** Marks

| | | | |
|---|---|---|---|
| 1 | | Analyse the working of a combination clipper using diodes. | (3) |
| 2 | | Draw the h-Parameter model of a BJT. | (3) |
| 3 | | Illustrate the effect of Miller capacitance in the frequency response of a CS amplifier. | (3) |
| 4 | | Draw and explain the drain characteristics of JFET. | (3) |
| 5 | | Explain the working of Class C power amplifier. | (3) |
| 6 | | Compare positive feedback with negative feedback. | (3) |
| 7 | | State Bark Hausen's Criterion for sustained oscillations. | (3) |
| 8 | | How can op-amps be used to subtract two input voltages. | (3) |
| 9 | | Show that the output from a differentiating circuit is derivative of the input. | (3) |
| 10 | | Design a zero-crossing detector circuit using an op-amp. | (3) |

**PART B**

***Answer any one full question from each module. Each question carries 14 marks***

**Module 1**

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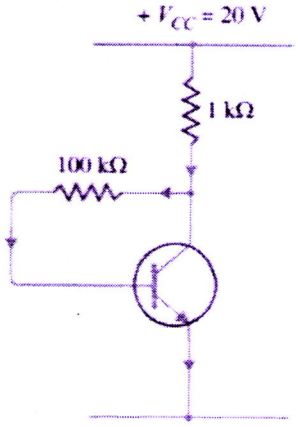
|---|---|---|---|
| 11 | a | What is the necessity of biasing circuits? With a neat circuit diagram derive the expression for stability factor for a fixed bias circuit. | (7) |
| | b | Consider the Collector feedback Resistor Bias circuit as shown in the figure below that has a silicon transistor with $\beta$=100 and $V_{BE}$=0.7 V. a) Find the operating point. b) Find the new operating point if $\beta$=50 and all other circuit parameters remaining the same? | (7) |

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|---|---|---|---|
| 12 | a | Sketch and explain the working of a positive shunt clipper to clip an input sinusoidal signal having peak values at ± 6V, to a positive reference voltage of +2V. | (4) |
| | b | Explain the role of coupling and emitter bypass capacitors in amplifier circuits. | (4) |
| | c | Draw and explain the circuit for bias compensation using thermistor. | (6) |

**Module 2**

| | | | |
|---|---|---|---|
| 13 | a | With neat sketches explain the construction, working and characteristics of N-channel enhancement MOSFET. | (8) |
| | b | Explain voltage divider biasing scheme for JFET with the help of a neat sketch. | (6) |
| 14 | a | For a CS amplifier, draw the small signal equivalent circuit and determine the expression for gain, input impedance and output impedance. | (10) |
| | b | How can an FET act as a Voltage Controlled Resistance? | (4) |

**Module 3**

| | | | |
|---|---|---|---|
| 15 | a | Draw the circuit diagram and explain the working of a two stage RC Coupled amplifier. Also list its advantages and disadvantages. | (8) |
| | b | Explain the effect of negative feedback on gain, input impedance and bandwidth. | (6) |
| 16 | a | Explain the working of a Transformer coupled class A power amplifier with a neat circuit diagram. Derive the expression for maximum efficiency. | (9) |
| | b | With a neat schematic diagram explain the working of Direct coupled Transistor Amplifier. | (5) |

**Module 4**

| | | | |
|---|---|---|---|
| 17 | a | Analyse the working of an RC Phase shift oscillator with a neat diagram. Derive the expression for gain and frequency of oscillation. | (10) |
| | b | Design a non-inverting amplifier using op-amp. Derive the expression for its output voltage. | (4) |

| | | | |
|---|---|---|---|
| 18 | a | Explain the working of a crystal oscillator. | (4) |
| | b | Define the terms, CMRR and slew rate of an op-amp. Also specify their typical values for IC741. | (5) |
| | c | Design a summing amplifier circuit using op-amp to yield $V_O = -V_1+2V_2-3V_3$. Assume the feedback resistance $R_f$ as 10 K$\Omega$. | (5) |

**Module 5**

| | | | |
|---|---|---|---|
| 19 | a | With neat functional diagrams and relevant waveforms, Explain the working of Astable multivibrator using IC555 timer. | (8) |
| | b | Design a square waveform generator using op-amp for a frequency of 1KHz. | (6) |
| 20 | a | Draw and explain the circuit of a Schmitt trigger circuit using op-amp. Explain the terms UTP and LTP of a Schmitt trigger. | (7) |
| | b | Explain the principle of operation of a PLL IC 565 with the help of a block diagram. | (7) |

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