

Register No.: ..... Name: .....

## SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

THIRD SEMESTER B.TECH DEGREE EXAMINATION (R,S), DECEMBER 2023

ROBOTICS AND AUTOMATION

(2020 SCHEME)

Course Code : 20RBT203

Course Name: Electronic Devices and Circuits

Max. Marks : 100

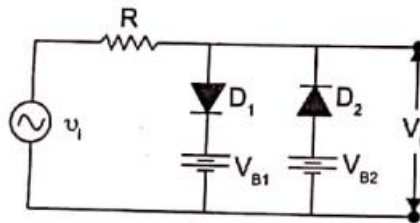
Duration: 3 Hours

### PART A

*(Answer all questions. Each question carries 3 marks)*

1. For the circuit shown below, Give the diode condition (On/OFF) for the following cases

(a).  $V_{B2} < V_i < V_{B1}$  (b).  $V_i > +V_{B1}$  (c).  $V_i < -V_{B2}$



2. Compare DC and AC load lines with suitable graph.
3. Sketch the transfer characteristics along with drain characteristics of JFET.
4. Derive the relation between  $g_m$  and  $g_{m0}$ .
5. Sketch the circuit diagram of transformer coupled amplifier and briefly explain.
6. Derive the conversion efficiency of a class B power amplifier.
7. State and explain Barkhausen's Criteria.
8. List the characteristics of an ideal op-amp.
9. Define CMRR and explain.
10. Infer the effect of slew rate on waveform generation in op-amp.

### PART B

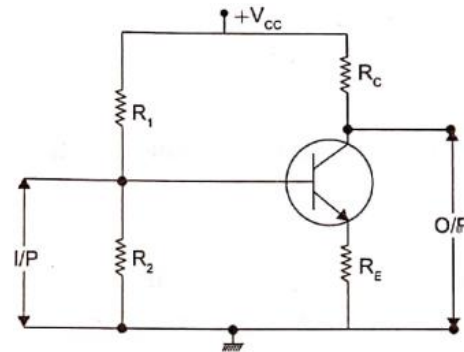
*(Answer one full question from each module, each question carries 14 marks)*

#### MODULE I

11. a) Design a Zener diode voltage regulator for a load current of 50mA and output voltage of 5V. (7)
- b) Explain the hybrid model for CE configuration and write its h parameter equations. (7)

OR

12. a) For the voltage divider configuration shown below having  $\beta=140$ ,  $V_{CC}=22V$ ,  $R_C=10K\Omega$ ,  $R_E=1.5k\Omega$ ,  $R_1=39k\Omega$ ,  $R_2=3.9k\Omega$ , calculate  $V_{CE}$  and  $I_C$ .



(7)

- b) Illustrate the working of negative clamping circuit with suitable diagrams. (7)

### MODULE II

13. a) Explain the construction and working of N-channel Depletion MOSFET with necessary illustration. (7)  
 b) Analyze CS amplifier-voltage divider bias circuit using small signal model. (7)

OR

14. a) Draw and explain the drain characteristics of N-channel JFET. (7)  
 b) Perform high frequency analysis of common emitter BJT amplifier with its necessary circuit diagrams. (7)

### MODULE III

15. a) Sketch and explain the working of a two stage RC coupled amplifier. Mention its advantages and disadvantages. (8)  
 b) Classify the topologies of feedback amplifiers with its block diagram and compare their input and output impedances. (6)

OR

16. a) With the necessary block diagram, derive the overall gain of an amplifier for positive and negative feedback. (8)  
 b) Explain the operation of class B power amplifier with its circuit diagram. (6)

### MODULE IV

17. a) Explain the working of Colpitt's oscillator. (8)  
 b) Explain the working of summing amplifier using op-amp. (6)

OR

18. a) With a neat circuit diagram, explain the operation of BJT based RC Phase shift oscillator and derive its frequency of oscillation. (8)  
 b) Explain the working of inverting amplifier using operational amplifier. Derive the expression for its voltage gain. (6)

**MODULE V**

19. a) Explain the operation of an instrumentation amplifier using op-amp. (7)  
b) Illustrate the operation of a Monostable multivibrator using 555 Timer IC. (7)

**OR**

20. a) With a suitable circuit, explain the operation of converting sine wave into square wave. (7)  
b) Draw the functional block diagram of IC565 and explain its operation. (7)

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