Reg. No															

B.Tech DEGREE EXAMINATION, DECEMBER 2023

Third Semester

18MHC103T - SOLID STATE DEVICES AND CIRCUITS

(For the candidates admitted during the academic year (2020-2021 & 2021-20222))

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks) — Answer **all** Questions

		Marks	BL	CO
1.	In the normal operation of an SCR, anode is _____ with respect to cathode (A) At zero potential (B) Negative (C) Positive (D) either negative or positive	1	1	1
2.	An intrinsic semiconductor at absolute zero _____ (A) becomes extrinsic semiconductor (B) behaves like an insulator (C) disintegrates into pieces (D) becomes superconductor	1	2	1
3.	What diode operates only with majority carriers? (A) laser (B) tunnel (C) Schottky (D) step-recovery	1	1	1
4.	Between the peak point and the valley point of UJT emitter characteristics we have_____ region (A) Saturation (B) Negative resistance (C) Cut-off (D) Active	1	2	1
5.	If temperature changes, h parameters of a transistor _____ (A) Also change (B) Does not change (C) Remains same (D) May or may not change	1	2	2
6.	Tuned circuit is never used in _____ (A) Radio receiver (B) Television rectifier (C) Radio transmitter (D) Public address system	1	2	2
7.	When a transistor is cut off _____ (A) Maximum voltage appears across transistor (B) Maximum current flows (C) Maximum voltage appears across load (D) Minimum voltage appears across load	1	2	2
8.	The push-pull circuit must use _____ operation (A) Class A (B) Class C (C) Class B (D) Class AB	1	1	2
9.	Total phase shift provided by all phase shift networks in RC phase shift oscillator is _____ (A) 180 degrees (B) 60 degrees (C) 120 degrees (D) 360 degrees	1	1	3
10.	The closed loop voltage gain is reciprocal of _____ (A) Voltage gain of op-amp (B) Gain of the feedback circuit (C) Open loop voltage gain (D) current gain of op amp	1	2	3

11.	Write the formula for closed loop voltage gain of inverting amplifier with feedback using open loop voltage gain and gain of feedback circuit (A) AF= A/(1+AB) (B) AF= -A/(1+AB) (C) AF= -B/(1+AB) (D) AF= B/(1+AB)	1	1	3
12.	At the resonant frequency, what is the phase shift for the output in a Wien Bridge oscillator? (A) 0° (B) 45° (C) 90° (D) 180°	1	2	3
13.	In an unregulated power supply, if load current increases, the output voltage _____ (A) Remains the same (B) Decreases (C) Increases (D) Constant	1	2	4
14.	Full wave rectifier has a maximum efficiency of _____ (A) 40.6 (B) 81.2 (C) 78.5 (D) 50	1	1	4
15.	Which component of colpitts oscillator is used in feedback system? (A) Inductor (B) Resistor (C) capacitor (D) Transistor	1	1	4
16.	In a phase shift oscillator, we use _____ RC sections (A) 2 (B) 3 (C) 4 (D) 5	1	1	4
17.	The gain of differential amplifier with one op-amp is same as that of (A) The inverting amplifier (B) The non-inverting amplifier (C) Both inverting and non-inverting amplifier (D) Summer	1	2	5
18.	Why differential amplifiers are preferred for instrumentation and industrial applications? (A) Input resistance is low (B) Produce amplified output (C) Amplify individual input voltage (D) Reject common mode voltage	1	2	5
19.	In the expression Vo=-A*Vin, A is called _____ (A) closed loop gain (B) closed loop fault (C) open loop fault (D) open loop gain	1	1	5
20.	Which among the following is a nonlinear application of op-amp? (A) V to I converter (B) Comparator (C) Precision rectifier (D) Instrumentation amplifier	1	2	5

PART - B (5 × 4 = 20 Marks)

Answer **any 5** Questions

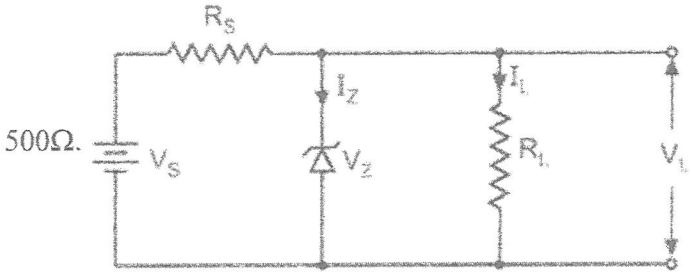
		Marks	BL	CO
21.	Analyse how a semiconductor material behaves when it is made in contact with a metal.	4	3	1
22.	How can a SCR be formed using two transistors? Brief with diagram.	4	3	1
23.	Write short notes on how the stability of the self-biasing method can be improved?	4	2	2
24.	Derive the frequency of oscillation and feedback factor of Hartley oscillator.	4	2	2
25.	With proper diagram explain voltage series feedback circuit.	4	2	3
26.	Brief the working principle of half wave rectifier circuit.	4	2	4
27.	Explain each block of the internal block diagram of op-amp.	4	2	5

PART - C (5 × 12 = 60 Marks)

Answer **all** Questions

		Marks	BL	C

28. (a) A shunt voltage regulator is shown in the below figure. Calculate the load voltage, voltage drop across the series resistance and the current through the diode. Whereas R_s is 240Ω, V_s is 30V, V_z is 12 V, and load resistance is 500Ω. 12 3 1



(OR)

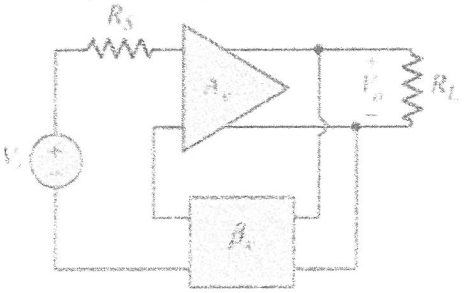
(b) How does a tunnel diode differ from a conventional PN junction diode? With the help of energy band diagram explain its principle of operation in forward and reverse bias condition.

29. (a) Name the biasing method whose operating point is independent of stability factor. Also derive the parameters for the corresponding network with supporting diagrams. 12 2 2

(OR)

(b) A class B push pull amplifier drives a load of 16Ω is connected to the secondary of the ideal transformer. The supply voltage is 25V, if the number of turns of the primary is 200 and secondary is 50. Calculate maximum power output, DC power input, efficiency and maximum power dissipated per transistor.

30. (a) According to the sampling and mixing configuration used in the below circuit, name the feedback topology and design its equivalent circuit with its own equivalent input impedance, output impedance and gain factor, with all the diagrams required. 12 3 3



(OR)

(b) Derive the frequency of oscillation and feedback factor of Colpitts oscillator and also design a Colpitts oscillator which as 1 mH inductor and frequency of oscillation is MHz and feedback factor is 25.

31. (a) Define SMPS. List out the various types of SMPS and explain them in detail with relevant diagrams. 12 2 4

(OR)

(b) Describe the operation of bistable multivibrator with the help of the circuit diagram and characteristics curve.

32. (a) Explain how an Op-amp can be used as voltage to current and current to voltage converters. 12 2 5

(OR)

(b) Summarize the AC and DC characteristics of Op-amp and explain them with proper expressions and relevant diagrams.

* * * * *