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UGC-NET Previous Solved Papers : Electronic Science

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First Edition : 2023

Second Edition : 2024

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Preface

It is commonly said “Teaching is the profession which creates all other professions” and “Research is the new knowledge”; so aren’t these professions an instruments to serve the nation?

Of course yes, from Dr.S.Radhakrishnan to Dr. APJ Abdul Kalam, they will be remembered for their marvellous works, apart from technical jobs in engineering services or PSUs, this is equally a good choice to contribute in the saga of India’s development. UGC-NET provides opportunity for budding engineers to become future renowned scholars of this country and entire world.

This is one such exam which opens a direct gateway to lectureship in colleges, universities as an Assistant Professor and also to make remarkable progress in the field of research by awarding JRF.

Preparation of any exam is complete only when set of variety of questions is practised. To help all the students in their preparation MADE EASY team made efforts and came up with compilation of all previous years’ questions of UGC-NET exam with accurate and detailed solutions. This book is not only helpful for UGC-NET but also for GATE, ISRO, DRDO, HAL, BARC, CIL, BHEL, BEL, UPPCL, GAIL, DMRC and other competitive exams and other competitive exams for engineering graduates.

I would like to give credit to MADE EASY team for solving previous years’ questions with correctness and making it a medium to serve students. Providing good study material and quality guidance are two ways to help each and every student and this book fulfils my aim to contribute in success of every aspirant.



B. Singh (Ex. IES)

With Best Wishes

B. Singh (Ex-IES)

CMD, MADE EASY Group

UGC-NET

Previous Year Solved Papers

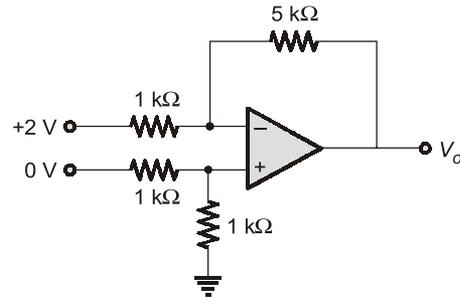
Electronic Science

Sl.	TOPIC.....	PAGE No.
1.	UGC NET : June-2012 (Paper-II).....	1-7
2.	UGC NET : June- 2012 (Paper-III).....	8-20
3.	UGC NET : Dec-2012 (Paper-II).....	21-30
4.	UGC NET : Dec-2012 (Paper-III).....	31-43
5.	UGC NET : June-2013 (Paper-II).....	44-50
6.	UGC NET : June-2013 (Paper-III).....	51-59
7.	UGC NET : Dec-2013 (Paper-II).....	60-67
8.	UGC NET : Dec-2013 (Paper-III).....	68-78
9.	UGC NET : June-2014 (Paper-II).....	79-86
10.	UGC NET : June-2014 (Paper-III).....	87-98
11.	UGC NET : Dec-2014 (Paper-II).....	99-106
12.	UGC NET : Dec-2014 (Paper-III).....	107-116
13.	UGC NET : June-2015 (Paper-II).....	117-125
14.	UGC NET : June-2015 (Paper-III).....	126-140
15.	UGC NET : Dec-2015 (Paper-II).....	141-149
16.	UGC NET : Dec-2015 (Paper-III).....	150-163
17.	UGC NET : July-2016 (Paper-II).....	164-174
18.	UGC NET : July-2016 (Paper-III).....	175-189
19.	UGC NET : Dec-2016 (Paper-II).....	190-199
20.	UGC NET : Dec-2016 (Paper-III).....	200-213
21.	UGC NET : Jan-2017 (Paper-II).....	214-223
22.	UGC NET : Jan-2017 (Paper-III).....	224-238
23.	UGC NET : Nov-2017 (Paper-II).....	239-248
24.	UGC NET : Nov-2017 (Paper-III).....	249-263

25.	UGC NET : 2018 (Exam held on 19 th December, 2018)	264-291
26.	UGC NET : 2019 (Exam held on 20 th September, 2019)	292-310
27.	UGC NET : 2019 (Exam held on 3 rd December, 2019)	311-330
28.	UGC NET : 2020 (Exam held on 5 th November, 2020)	331-353
29.	UGC NET : 2021 (Exam held on 3 rd December, 2021)	354-377
30.	UGC NET : 2022 (Exam held on 29 th October, 2022)	378-398
31.	UGC NET : 2022 (Exam held on 22 nd February, 2023)	399-420
32.	UGC NET : 2023 (Exam held on 13 th December, 2023)	421-445



1. In a JFET the change in drain current is due to the applied
 - (a) Electric field between S and D .
 - (b) Electric field between G and S .
 - (c) Magnetic field between S and D .
 - (d) Magnetic field between G and S .
2. The increase in temperature, the electrical conductivity would
 - (a) increase in metals as well as increase in semiconductors
 - (b) increase in metals but decrease in semiconductors
 - (c) decrease in metals but increase in semiconductors
 - (d) decrease in metals as well as in semiconductors
3. A network contains only independent current sources and resistors. If values of all resistors are doubled, then values of node voltages
 - (a) will become half
 - (b) will remain unchanged
 - (c) will become double
 - (d) cannot be determined unless circuit configuration and values of the resistors are known
4. Thevenin's theorem replaces a complicated circuit facing a load by an
 - (a) ideal voltage source and parallel resistor
 - (b) ideal current source and parallel resistor
 - (c) ideal current source and series resistor
 - (d) ideal voltage source and series resistor
5. When Op-Amp is used as an integrator, the feedback element is
 - (a) Resistor
 - (b) Capacitor
 - (c) Zener diode
 - (d) Voltage divider
6. The output V_o of the ideal Op-Amp circuit shown in the figure is



- (a) -10 V
- (b) -5 V
- (c) 5 V
- (d) 10 V

7. How many Flip-Flops are required to build a binary counter circuit to count from 0 to 1023?
 - (a) 1
 - (b) 6
 - (c) 10
 - (d) 24
8. Among the following, the slowest ADC (Analog-to-digital converter) is
 - (a) Parallel-comparator (i.e.) flash type
 - (b) Successive approximation type
 - (c) Integrating type
 - (d) Counting type
9. In a microcomputer, WAIT states are used to
 - (a) make the processor wait during a DMA operation
 - (b) make the processor wait during a power interrupt processing
 - (c) make the processor wait during a power shut down
 - (d) interface slow peripherals to the processor
10. In a microprocessor, the register which holds the address of the next instruction to be fetched is
 - (a) Accumulator
 - (b) Program Counter
 - (c) Stack Pointer
 - (d) Instruction Register
11. Consider the following structure and declaration:
 1. struct date {
 2. int day;
 3. int month;
 4. int year;
 5. };
 Struct data *pd ;

Which of the following is the correct method to refer to the year member?

- (a) (*pd) · year (b) (*pd)*year
(c) (*pd) → year (d) pd → year

12. Which of the following is not a linear data structure?

- (a) Array (b) Linked list
(c) Stack (d) Tree

13. $\nabla^2 V = -\frac{\rho}{\epsilon}$ represents

- (a) Maxwell's (b) equation
(c) Laplace's equation (d) Gauss's law

14. The energy per unit time, per unit area transported by the electromagnetic fields is expressed as

- (a) $\vec{S} = \frac{1}{\mu_0} (\vec{E} \times \vec{B})$ (b) $\vec{S} = (\vec{E} \times \vec{B})$
(c) $\vec{S} = \mu_0 (\vec{E} \times \vec{B})$ (d) $\vec{S} = \frac{1}{\epsilon_0} (\vec{E} \times \vec{B})$

15. Time-Division Multiplexing

- (a) can be used with PAM only.
(b) combines five groups into a supergroup.
(c) stacks 24 channels in adjacent frequency slots.
(d) interleaves pulses belonging to different transmissions.

16. One of the following types of noise becomes of great importance at high frequencies. It is the

- (a) Shot noise (b) Random noise
(c) Impulse noise (d) Transit-time noise

17. A relaxation oscillator is one which

- (a) oscillates continuously
(b) has two stable states
(c) relax indefinitely
(d) produces non-sinusoidal output

18. The transducer which generates electrical power

- (a) Photoconductor (b) Photodiode
(c) Solar cell (d) Phototransistor

19. The step-index monomode fiber has diameter

- (a) $\leq 10 \mu\text{m}$ (b) $50 \mu\text{m}$
(c) $100 \mu\text{m}$ (d) $200 \mu\text{m}$

20. Which control system has hysteresis property?

- (a) ON-OFF controller (b) Proportional controller
(c) Integral controller (d) P-I-D controller

Q. No(s) 21 to 30 : The following items consist of two statements, one labelled the "Assertion (A)" and the other labelled the "Reason (R)". you are to examine these two statements carefully and decide if the Assertion (A) and the Reason (R) individually true and if so, whether the Reason is a correct explanation of the Assertion. Select your answer to these items using the code given below and mark your answer accordingly:

Codes:

- (a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true, but (R) is not correct explanation of (A).
(c) (A) is true, but (R) is false
(d) (A) is false, but (R) is true

21. Assertion (A): If a semiconductor is placed in a transverse magnetic field B and an electric field E is applied across its other two faces, then it would produce an electric current I , in the direction perpendicular to both B and E .

Reason (R): Hall co-efficient is proportional to the mobility of charge carrier in semi-conductor.

22. Assertion (A): The voltage-current characteristic of tunnel diode exhibits dynamic negative resistance region.

Reason (R): The negative resistance occurs, therefore, tunnel diode behaves as low power oscillating device.

23. Assertion (A): R-2R ladder type D/A converter has a higher speed of conversion than a weighted resistance D/A converter.

Reason (R): R-2R ladder type D/A converter uses a smaller number of components than the weighted resistance D/A converter.

24. Assertion (A): A processor can reference a memory stack without specifying an address.

Reason (R): The address is always available and automatically updated in the stack pointer.

25. Assertion (A): The part of root locus on the real axis is not dependent upon the poles and zeros which are not on the real axis.

Reason (R): Poles and zeros which are not on the real axis always occur in conjugate pairs.

Answers UGC NET Paper-II : June-2012

1. (b) 2. (c) 3. (c) 4. (d) 5. (b) 6. (a) 7. (c) 8. (c) 9. (d) 10. (b)
 11. (a) 12. (d) 13. (c) 14. (a) 15. (d) 16. (d) 17. (d) 18. (c) 19. (a) 20. (d)
 21. (b) 22. (c) 23. (a) 24. (a) 25. (a) 26. (a) 27. (a) 28. (c) 29. (c) 30. (a)
 31. (c) 32. (d) 33. (b) 34. (b) 35. (b) 36. (c) 37. (c) 38. (b) 39. (b) 40. (d)
 41. (d) 42. (b) 43. (c) 44. (b) 45. (a) 46. (b) 47. (b) 48. (d) 49. (a) 50. (c)

Explanations UGC NET Paper-II : June-2012**1. (b)**

In a JFET, the change in drain current is due to the applied electric field between Gate (G) and Source (S).

$$\text{Drain current, } I_D = I_{DSS} \left[1 - \frac{V_{GS}}{V_p} \right]^2.$$

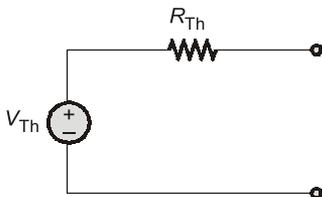
2. (c)

In case of metals, with increase in temperature the atoms starts vibrating and thus offer resistance to the flow of electrons. Hence, the electrical conductivity decreases.

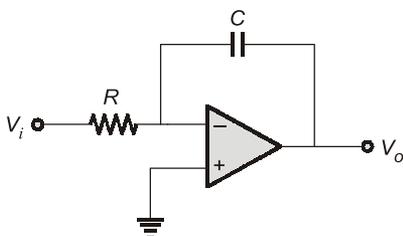
In case of semiconductors, with increase in temperature, the mobility of electrons increases and electrons starts shifting from valence band to conduction band, hence its conductivity increases.

4. (d)

Thevenin's theorem:

**5. (b)**

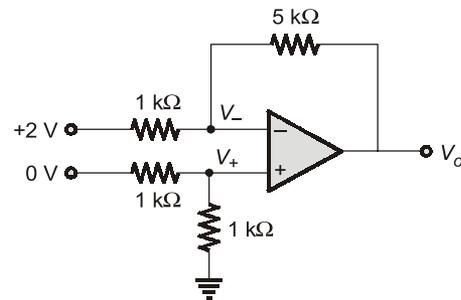
Op-amp integrator can be drawn as,



$$\therefore V_o = -\frac{1}{RC} \int V_i dt$$

6. (a)

Given op-amp circuit,



Since it is an ideal op-amp,

$$V_+ = V_- \\ V_+ = 0 \text{ V} = V_-$$

At inverting terminal,

$$\frac{V_- - 2}{1 \text{ k}\Omega} + \frac{V_- - V_o}{5 \text{ k}\Omega} = 0$$

$$5V_- - 10 + V_- - V_o = 0$$

$$6V_- - 10 = V_o$$

$$\therefore V_o = -10 \text{ V}$$

7. (c)

For a binary counter to count 0 to 1023, number of flip-flops required

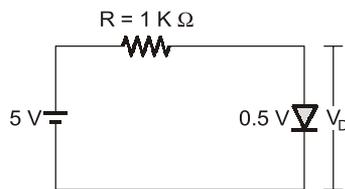
$$2^n \leq 1024$$

$$\therefore n = 10$$

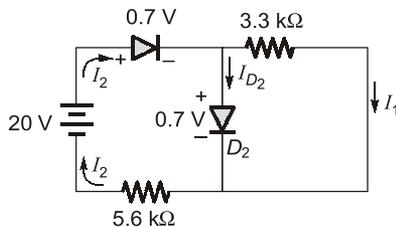
8. (c)

Integrating type analog-to-digital converter is slowest ADC.

1. In case a reverse biased photodiode is kept in dark condition, the current flowing through the device corresponds to:
- Maximum value of current which can flow through the device
 - Value of reverse saturation current
 - Normal value of current'
 - Zero
2. The diode used in fig. below has the threshold voltage of 0.5 V and a forward resistance of 4 Ω. Calculate the current flow I_D through and the voltage drop V_D across the diode.

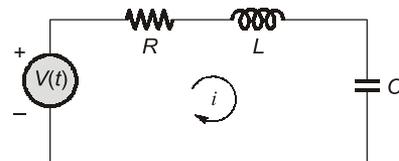


- $I_D = 4.521$ mA, $V_D = 0.45$ V
 - $I_D = 4.621$ mA, $V_D = 0.48$ V
 - $I_D = 4.482$ mA, $V_D = 0.52$ V
 - $I_D = 4.321$ mA, $V_D = 0.62$ V
3. What current should flow through D_2 diode? Consider the values given in circuit below.



- 1.12 mA
 - 2.11 mA
 - 3.11 mA
 - 4.11 mA
4. The ratio of peak to peak input ripple voltage to peak to peak ripple output voltage is known as:
- Ripple Voltage
 - Ripple Current
 - Ripple gain or Ripple Factor
 - Ripple rejection

5. Approximate oxide capacitance value (C_{ox}) for saturation operating mode of MOS transistor is:
- 0
 - $C_{ox} WL$
 - $C_{ox} W.L_D$
 - $\frac{1}{2}C_{ox}WL + C_{ox}W.L_D$
6. In a MOS transistor, if n^+ region is diffused in p-type substrate, the type of pn junction generated towards channel and drain is:
- n^+/p^+
 - n^+/p
 - n/p^+
 - n/p
7. For an n-channel MOS transistor with $\mu_n = 600$ cm²/Vs, $C_{ox} = 7 \times 10^{-8}$ F/cm², $W = 40$ μm, $L = 4$ μm and $V_{TO} = 1.0$ V the value of K parameter is:
- 0.28 mA/V²
 - 42×10^{-5} A/V²
 - 62 mA/V²
 - 36 mA/V²
8. Consider a resistive load inverter with $V_{DD} = 5$ V, $K'n = 20$ μA/V², $V_{TO} = 0.7$ V, $R_L = 500$ kΩ and $\frac{W}{L} = 3$. Value of critical voltage V_{OH} is:
- 0 V
 - 0.147 V
 - 0.925 V
 - 5 V
9. For series RLC circuit given below in figure, choose the correct answer based on Kirchoff's voltage law from following:



- $Ri + L \frac{di}{dt} - \frac{1}{C} \int i dt = V(t)$
- $Ri + L \frac{di}{dt} + \frac{1}{C} \int i dt = V(t)$
- $Ri + L \int i dt + \frac{1}{C} \int i dt = V(t)$
- $Ri + \frac{1}{L} \int i dt + \frac{1}{C} \int i dt = V(t)$

10. Unit parabolic function is represented by its Laplace transform as:

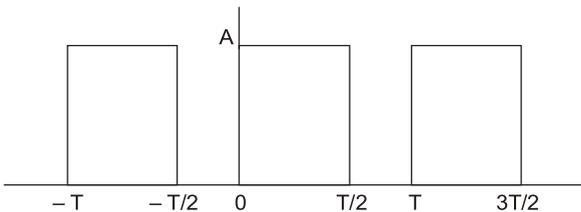
- (a) $\frac{1}{s^2}$ (b) $\frac{1}{s^3}$
- (c) $\frac{1}{s}$ (d) s^2

11. Two port network is given in Figure above, select equations for transmission parameters from the given below equations



- (a) $V_1 = Z_{11}I_1 + Z_{12}I_2$
 $V_2 = Z_{21}I_1 + Z_{22}I_2$
- (b) $I_1 = Y_{11}V_1 + Y_{12}V_2$
 $I_2 = Y_{21}V_1 + Y_{22}V_2$
- (c) $V_1 = AV_2 - BI_2$
 $I_1 = CV_2 - DI_2$
- (d) $V_2 = A'V_1 - B'I_1$
 $I_2 = C'V_1 - D'I_1$

12. For Fourier series of wave shown in figure below, Select correct expression for $f(t)$



- (a) $f(t) = \frac{A}{2} + \frac{2A}{\pi} [\sin(\omega_0 t) + \frac{1}{3} (\sin 3\omega_0 t) + \dots]$
- (b) $f(t) = A + \frac{2A}{\pi} [\sin(\omega_0 t) + \frac{1}{3} \sin(3\omega_0 t) + \dots]$
- (c) $f(t) = \frac{A}{4} + \frac{A}{\pi} [\sin(\omega_0 t) + \frac{1}{3} \sin(3\omega_0 t) + \dots]$
- (d) $f(t) = \frac{A}{2} + \frac{2A}{\pi} [\sin(\omega_0 t) + \frac{1}{3} \sin(2\omega_0 t) + \dots]$

13. The quiescent state of transistor is when

- (a) It is unbiased
- (b) Biased but no signal is applied
- (c) No current flows
- (d) Punch through occurs at collector junction

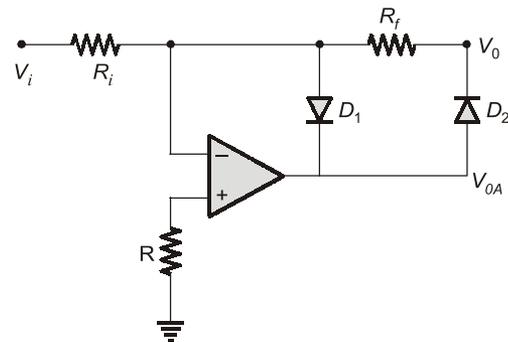
14. The current amplification factor in radian square of Colpitts oscillator is:

- (a) $C_1 \cdot C_2$ (b) $C_1 + C_2$
- (c) $C_1 - C_2$ (d) $\frac{C_1}{C_2}$

15. The two input terminals of an op-amp are connected to voltage signals of strength $745 \mu\text{V}$ and $740 \mu\text{V}$ respectively. The gain of the Op-Amp in differential mode is 5×10^5 and CMRR is 100 dB. What should be the output voltage?

- (a) 2.75 V (b) 2.65 V
- (c) 2.45 V (d) 2.57 V

16. The given operational amplifier circuit corresponds to which electronic circuit application?

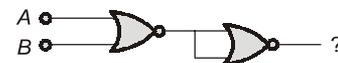


- (a) Half wave rectification
- (b) Full wave rectification
- (c) Voltage Doubler circuit
- (d) Peak detector circuit

17. Choose the correct answer from the decimal to octal conversion given below.

- (a) $(0.125)_{10} = (0.100)_8$
- (b) $(0.125)_{10} = (0.200)_8$
- (c) $(0.125)_{10} = (0.300)_8$
- (d) $(0.125)_{10} = (0.400)_8$

18. Compute output of following logic gates as combinational circuit.



- (a) $A - B$ (b) $A + B$
- (c) $\bar{A} + B$ (d) $\bar{A} + \bar{B}$

19. Sum of products equation is given below as $Y = \bar{A}BC + A\bar{B}C + AB\bar{C} + ABC$. Identify the correct representation of the above equation from:

- (a) $Y = F(A, B, C) = \Sigma m(3, 4, 5, 6)$
- (b) $Y = F(A, B, C) = \Sigma m(3, 5, 6, 7)$
- (c) $Y = F(A, B, C) = \Sigma m(2, 3, 4, 5)$
- (d) $Y = F(A, B, C) = \Sigma m(4, 5, 6, 7)$

20. The truth table of D flip-flop is given below:

C	D	Q_{n+1}
0	X	$Q_n(\text{LastState})$
↑	0	0
↑	1	1

Choose exact characteristic equation based on above Truth Table

- (a) $Q_n = D_n$ (b) $Q_{n+1} = D_n$
 (c) $Q_{n+2} = D_n$ (d) $Q_{n+1} = D_{n+1}$

21. Loop 1 : MOV A, P1

MOV P2, A

JNB P3:3, Loop 1

The program does the following

- (a) Read data from port 1 and write it to port 2 until bit 3 of port 3 is set
 (b) Read data from port 1 and write it to port 2 until bit 3 of port 3 is reset
 (c) Read data from port 2 and write it to port 1 until bit 3 of port 3 is set
 (d) Read data from port 2 and write it to port 1 until bit 3 of port 3 is reset.

22. In an 8086, AL = 19 BCD & BL = 36 BCD prior to execution of following example

ADD AL, BL

DAA

What will be content of AL after execution of the example?

- (a) 4 F (b) 5 5
 (c) 1 7 (d) 4 D

23. The BIU of 8086 contains 16 bit segment registers. What is the width of address sent out by BIU of 8086 microprocessor?

- (a) 15 bit (b) 16 bit
 (c) 20 bit (d) 64 bit

24. If SS = 3000 H and SP = 2000 H in 8086 microprocessor, in which memory addresses the contents of BL and BH are stored respectively, when PUSH BX instruction is executed.

- (a) 31FFF H, 31FFE H (b) 21FFE H, 21FFF H
 (c) 21FFFH, 21FFE H (d) 31FFE H, 31FFFH

25. An Elliptical polarized wave has an electric field of $\vec{E} = \sin(\omega t - \beta z)\hat{a}_x + 2\sin(\omega t - \beta z + 75^\circ)\hat{a}_y$ V/m.

The power per unit area conveyed by the wave in free space.

- (a) 6.63 W/m² (b) 6.63 mW/m²
 (c) 16.63 mW/m² (d) 0.663 W/m²

26. Which one of the fundamental equation was modified by Maxwell to form the basis of electro magnetic theory?

- (a) Gauss Law of electrostatics
 (b) Ampere Law
 (c) Gauss Law of Magnetostatics
 (d) Faraday's Law

27. A scalar function V is given by $V = 2xyz^2$. The gradient of V is given by:

- (a) $2yz^2\hat{a}_x + 2xz^2\hat{a}_y + 2xy\hat{a}_z$
 (b) $yz^2\hat{a}_x + xz^2\hat{a}_y + 2xyz\hat{a}_z$
 (c) $2yz^2\hat{a}_x + 2xz^2\hat{a}_y + 4xyz\hat{a}_z$
 (d) $2z^2\hat{a}_x + x\hat{a}_y + xyz\hat{a}_z$

28. 0 dBm power is transmitted, it means that actual power transmitted is :

- (a) 0 Watt (b) 1 Watt
 (c) 10 Watt (d) 1 mW

29. An optical fibre has numerical aperture (NA) of 0.3 and refractive index n_2 of cladding material is 1.6. What is the refractive index of core material?

- (a) 2.50 (b) 1.25
 (c) 3.52 (d) 1.63

30. In coherent binary FSK system the orthogonal sinusoidal signals of frequency 20 kHz and 50 kHz are used to represent '0' and '1' respectively. The maximum possible bit interval is:

- (a) 0.03 m sec (b) 0.0166 m sec
 (c) 0.05 m sec (d) 0.04 m sec

31. Demodulation of SSB signals can be achieved easily by:

- (a) Phase Shifters
 (b) Envelope detectors
 (c) Frequency discriminator
 (d) Coherent Detector

32. In case of wideband FM, the modulation index value is:

- (a) Around zero (b) much less than unity
 (c) unity (d) exceeds unity

33. Most of the practical control system require damping factor in the range of:

- (a) $0 < \xi < 0.1$ (b) $0 < \xi < 0.09$
 (c) $0 < \xi < 0.7$ (d) $0.28 < \xi < 0.7$

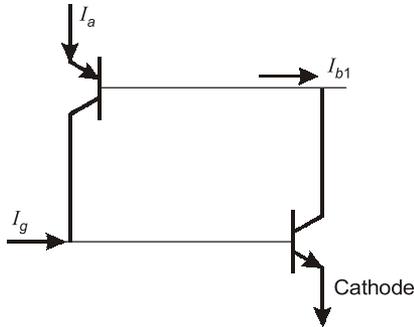
34. Consider a sixth order system with characteristic equation

$$s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0,$$

the control system is:

- (a) Stable (b) Unstable
(c) Limitedly stable (d) Oscillatory unstable

35. In two transistor model of an SCR the expression for anode current is given by:



- (a) $\frac{\alpha_2 I_g}{1 + \alpha_1 - \alpha_2}$ (b) $\frac{\alpha_1 I_g}{1 - \alpha_1 + \alpha_2}$
(c) $\frac{\alpha_2 I_g}{\alpha_1 + \alpha_2}$ (d) $\frac{\alpha_2 I_g}{1 - (\alpha_1 + \alpha_2)}$

36. Find the value of inductance in a series inverter circuit having the frequency of 5 kHz and a capacitance 1 μ F. If the inverter is operating under resonance condition. The value of inductance is given by:

- (a) 40 mH (b) 20 mH
(c) 80 mH (d) 10 mH

37. An ammeter of 1 mA possesses a resistance of 100 ohms. This ammeter is to be converted into 1A ammeter. The value of shunt resistance required will be:

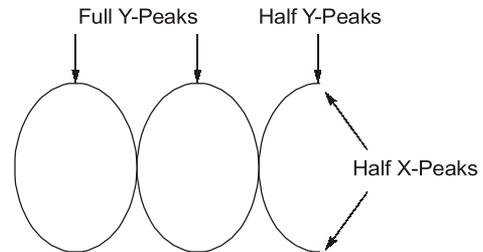
- (a) 0.001 Ω (b) 0.1001 Ω
(c) 100 Ω (d) 1200 Ω

38. Which of the following bridge is used for the measurement of capacitance, dielectric loss of capacitor and loss angle.

Choose the correct statements from the options given below:

- (a) Wheatstone Bridge
(b) Owen Bridge
(c) Schering Bridge
(d) Wein Bridge

39. For a Lissajous pattern as shown in Figure below, determine the frequency of vertical signal if the frequency of horizontal signal is 12 kHz.



- (a) 25 kHz (b) 30 kHz
(c) 15 kHz (d) 20 kHz

40. An LVDT is used for measuring the deflection of bellows. The sensitivity of LVDT is 40 V per mm. The bellows is deflected by 0.125 mm by a pressure of 0.8×10^6 N per m^2 . Determine the sensitivity of the LVDT in V per N/m^2 , when the voltage output of LVDT is 3.1 V.

- (a) 1.25×10^{-5} V per N/m^2
(b) 6.25×10^{-6} V per N/m^2
(c) 7.00×10^{-6} V per N/m^2
(d) 6.5×10^{-6} V per N/m^2

41. Read the statements:

- The O/P frequency of a half wave rectifier is equal to the input frequency.
- The O/P frequency of a full wave rectifier is double to the input frequency.
- The regulation of an excellent rectifier should be zero.
- Ripple factor in the full wave rectifier is 1.2.

Choose the correct statements from the options given below:

- (a) 1, 4 only (b) 2, 4 only
(c) 2, 3 only (d) 1, 3 only

42. Read the statements regarding transistor.

- The Doping level of emitter region is more than base region but less than collector region.
- The CB configuration is a good current amplifier circuit configuration.
- The phase difference between I/P and O/P waveforms of a CB configuration amplifying circuit is 0° .
- CC configuration transistor amplifier has higher value of I/P resistance and lower value of O/P resistance.

Choose the correct answer from the options given below.

- (a) 3 and 4 only (b) 1 and 3 only
(c) 1 and 4 only (d) 2 and 3 only

43. In MOS

1. The substrate fermi potential ϕ_F is negative in NMOS
2. The substrate fermi potential ϕ_F is positive in NMOS
3. The substrate bias voltage V_{SB} is positive in NMOS, negative in PMOS
4. The substrate bias voltage V_{SB} is negative in NMOS, positive in PMOS.

Choose the correct answer from the options given below:

- (a) 1 and 2 only (b) 2 and 4 only
(c) 1 and 3 only (d) 1 and 4 only

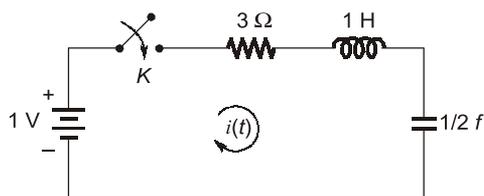
44. In VLSI design flow.

1. Algorithm describes the behaviour of target chip.
2. Architecture of processor is not mapped onto the chip surface by floor planning.
3. Behavioral domain defines FSMs.
4. Individual modules are implemented with leaf cells.

Choose the correct answer from the options given below:

- (a) 1, 3 and 4 only (b) 1, 2 and 4 only
(c) 2, 3 and 4 only (d) 2 and 4 only.

45. The RLC circuit given in figure below can be solved



1. Current $i(t)$ can be solved using KVL
2. Current $i(t)$ can be solved using KCL
3. Current $i(t)$ can be solved using Fourier transform
4. Current $i(t)$ can be solved using Laplace transform
5. Current $i(t)$ can be solved using Fourier series.

Choose the correct answer from the options given below:

- (a) 1, 3 and 4 only
(b) 1 and 3 only
(c) 1 and 4 only
(d) 1 and 2 only

46. Power absorbed by an element for $t = 10$ sec. if the current magnitude is $2e^{-0.1t}$ and the voltage across

the element is $V = 6 \frac{di}{dt}$, the absorbed power is:

1. -0.325 Watts
2. $-2.4e^{-0.2(10)}$ Watts
3. 0.325 Watts
4. $2.4e^{-0.2(10)}$ Watts
5. 0.625 Watts

Choose the correct answer from the options given below:

- (a) 1 and 2 only (b) 1 and 3 only
(c) 2 and 3 only (d) 3, 4 and 5 only

47. In an operational amplifiers–

1. IC 741 is an operational amplifier IC with 10 pins
2. Gain for non inverting operational amplifier configuration is $\left(1 + \frac{R_f}{R_1}\right)$

3. The value of CMRR for an ideal amplifier is 0.
4. Slew rate is an important parameter of op-amp which limits the bandwidth for large signals.

Choose the correct answer from the options given below:

- (a) 1 and 2 only (b) 2 and 4 only
(c) 2, 3 and 4 only (d) 1 and 4 only

48. Statements regarding rectifier are:

1. RMS value of current in a half wave rectifier is $\frac{I_m}{\sqrt{2}}$.
2. PIV of diode in a full wave bridge rectifier is V_m volts
3. TUF and rectification efficiency for a rectifier are same parameters.
4. Rectifier converts A.C. to rippled DC not pure D.C.

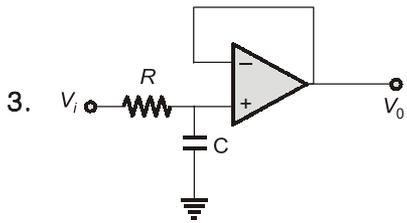
Choose the correct answer from the options given below:

- (a) 1 and 4 only (b) 3 and 4 only
(c) 2 and 4 only (d) 4 only

49. Statements in connection to Op-Amp applications are:

1. If we use a square wave generator followed by integrator circuit we get a triangular wave at the output.

2. The logarithmic amplifier called a log-amplifier or a logger, is basically a current to voltage converter.



- is a first order high pass filter with voltage follower
4. If we use a square wave generator followed by a clipping circuit then we get a saw-tooth wave generator.

Choose the correct answer from the options given below:

- (a) 1 and 2 only (b) 1 and 3 only
(c) 2 and 3 only (d) 2, 3 and 4 only

- 50.** The logic families have fan out more than TTL.

1. RTL
2. ECL
3. DTL
4. CMOS

Choose the correct answer from the options given below:

- (a) 1 and 2 only (b) 2 and 4 only
(c) 2 and 3 only (d) 3 and 4 only

- 51.** Read the following statements regarding decoder:

1. It is similar to demultiplexer
2. It does not have a data input
3. It is having data input lines
4. It converts n bit binary input to 2^n output lines.
5. It converts digital signals to analog signals.

Choose the correct answer from the options given below:

- (a) 2, 4 and 5 only (b) 1, 3 and 5 only
(c) 1, 2 and 4 only (d) 1, 2 and 5 only

- 52.** In 8051 micro controller

1. INT0 and INT1 pins are normally low
2. Timer1 Interrupt Flag is auto cleared after occurrence
3. Serial interrupt is auto cleared after occurrence
4. Timer 0 Vector location is 000B H

Choose the correct answer from the options given below:

- (a) 1 and 3 only (b) 1 and 4 only
(c) 2 and 4 only (d) 2 and 3 only

- 53.** In 8051

1. INT0 and INT1 can be made edge triggered by programming TCON
2. On reset serial communication interrupts has highest priority
3. Upon reset all interrupts are enabled
4. Only one interrupt is set aside for serial communication.

Choose the correct answer from the options given below:

- (a) 1 and 2 only (b) 2 and 3 only
(c) 3 and 4 only (d) 1 and 4 only

- 54.** In 8086

1. The stack memory is a FIFO (First In First Out)
2. The JMP instruction cannot be prefixed with segment override prefix
3. SAHF and POPF instructions affect the flag register
4. DAS instruction cannot be used for 8 bit operations.

Choose the correct answer from the options given below:

- (a) 1 and 4 only (b) 2 and 3 only
(c) 1 and 2 only (d) 3 and 4 only

- 55.** Varactor diodes have the following properties:

1. Junction capacitance varies with bias voltage
2. Junction capacitance varies with time.
3. Non linearity of varactor diodes makes them suitable for frequency multipliers.
4. Linearity of varactor diode makes them suitable for frequency multiplexers.

Choose the correct answer from the options given below:

- (a) 1 and 2 only (b) 2 and 3 only
(c) 1 and 3 only (d) 2 and 4 only

- 56.** The properties of Dirac Delta are

1. $\delta(t - t_0) = \infty$ if $t = t_0$
2. $\delta(t - t_0) = 0$ if $t \neq t_0$
3. $\delta(t - t_0) = 0$ if $t \neq t_0$
4. $\delta(t - t_0) = \infty$ if $t \neq t_0$
5. $\delta(t - t_0) = 1$ if $t = t_0$

Choose the correct answer from the options given below:

- (a) 1 and 3 only (b) 1 and 4 only
(c) 2 and 4 only (d) 4 and 5 only

- 57.** The RF section of Radio Receiver has:
1. Better coupling of receiver to Antenna
 2. Less Image-frequency rejection
 3. Greater Gain
 4. Allowing Re-radiation of local oscillator through the antenna of receiver.

Choose the correct answer from the options given below:

- (a) 2 and 3 only (b) 1 and 4 only
(c) 1 and 3 only (d) 2 and 4 only

- 58.** In amplitude modulation:
1. Amplitude of carrier is varied by modulating signal
 2. Modulation index is between 0 and 1
 3. Bandwidth is infinite
 4. Bandwidth is twice of minimum modulating frequency.

Choose the correct answer from the options given below:

- (a) 1 and 3 only (b) 1 and 2 only
(c) 2 and 4 only (d) 3 and 4 only

- 59.** Waveguides below cutoff have attenuation for:
1. Reflections from obstacles, discontinuities and misaligned waveguide sections.
 2. Losses due to currents flowing in waveguide walls
 3. Losses in dielectric filling the waveguide
 4. Gain in dielectric filling the waveguide.

Choose the correct answer from the options given below:

- (a) 1 and 2 only (b) 1, 2 and 3 only
(c) 3 and 4 only (d) 4 only

- 60.** An SCR has half cycle surge current rating of 3000 A for 50 Hz supply. It has
1. One cycle surge current = 2121.32 A
 2. One cycle surge current = 1121.32 A
 3. I^2t rating = 45000 Amp²
 4. I^2t rating = 1257358 Amp²

Choose the correct answer from the options given below:

- (a) 1 and 4 only (b) 1 and 3 only
(c) 2 and 4 only (d) 2 and 3 only

- 61.** Inverters are having following properties:
1. VSI uses force commutation
 2. VSI has negligible impedance
 3. VSI has large source impedances
 4. They work like choppers

Choose the correct answer from the options given below:

- (a) 2 and 4 only (b) 1, 3 and 4 only
(c) 1 and 2 only (d) 1 and 4 only

- 62.** The value of K_p in proportional, PI, PID, controllers are given
1. For proportional $K_p = T/L$
 2. For PI, $K_p = 0.9 T/L$
 3. For PI, $K_p = 1.7 T/L$
 4. For PID, $K_p = 1.2 T/L$
 5. For PID $K_p = 0.9 T/L$

Choose the correct answer from the options given below:

- (a) 1, 2 and 4 only (b) 1, 2 and 5 only
(c) 1 and 5 only (d) 3 and 4 only

- 63.** Incorrect statements regarding measurement are given:
1. Hot wire anemometer is used to measure displacement
 2. Hall effect is used to measure current
 3. LVDT is used to measure acceleration and gas flow
 4. Piezoelectric Transducer is used to measure acceleration

Choose the correct answer from the options given below:

- (a) 2 and 4 only (b) 1, 2 and 4 only
(c) 3 and 4 only (d) 1, 2 and 3 only

- 64.** Consider the following statements associated with electrical and electronic transducers
1. Little power is consumed by transducer
 2. Mass inertia effects are not minimized
 3. The response time is small
 4. Transmission and processing the signal for the purpose of measurement are easier.

Choose the correct answer from the options given below:

- (a) 1, 2 and 4 only (b) 1, 3 and 4 only
(c) 1, 2 and 3 only (d) 2, 3 and 4 only

- 65.** Consider the following statements regarding the advantages of Anderson Bridge
1. It is the modification of the Maxwell's inductance Capacitance Bridge
 2. For measuring the low Q of coils, it is not superior to Maxwell's bridge
 3. It is not simple as compared to Maxwell's Bridge
 4. It can be used to determine mutual inductance.

Choose the correct answer from the options given below:

- (a) 1, 2 and 4 only (b) 2, 3 and 4 only
- (c) 1, 3 and 4 only (d) 1, 2 and 3 only

66. Match List-I with List-II:

List-I

- A. Porcelain
- B. Steatite
- C. Mica
- D. Rutile

List-II

- 1. Used for high frequency applications
- 2. Releases water when heated
- 3. Used for capacitors to be operated in high frequency cases.
- 4. Used for insulators.

Choose the correct answer from the options given below:

	A	B	C	D
(a)	4	1	3	2
(b)	4	2	3	1
(c)	2	1	3	4
(d)	3	2	4	1

67. Match List-I with List-II

List-I

- A. When negative V_G is applied to gate of MOS
- B. When zero-bias is applied to gate of MOS
- C. When a small positive gate bias V_G is applied to gate of MOS
- D. When a higher positive gate V_G is applied to gate of MOS

List-II

- 1. Depletion
- 2. Surface Inversion
- 3. Accumulation
- 4. Neutral MOS

Choose the correct answer from the options given below:

	A	B	C	D
(a)	2	3	1	4
(b)	4	3	2	1
(c)	1	4	3	2
(d)	2	1	4	3

68. Match List-I with List-II

List-I

- A. Power
- B. Gain
- C. Resistance
- D. Inductance

List-II

- 1. dBi
- 2. Watts
- 3. Henry
- 4. Ohm

Choose the correct answer from the options given below:

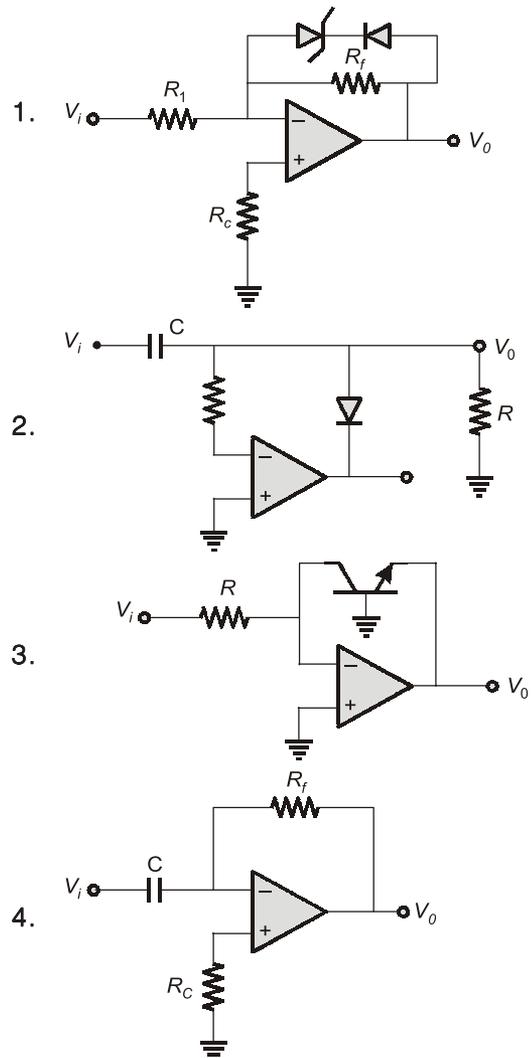
	A	B	C	D
(a)	1	3	2	4
(b)	4	3	1	2
(c)	3	1	4	2
(d)	2	1	4	3

69. Match List-I with List-II

List-I

- A. Single polarity positive voltage clipper circuit
- B. Negative clamping circuit
- C. Differentiator circuit
- D. Logarithmic Amplifier

List-II



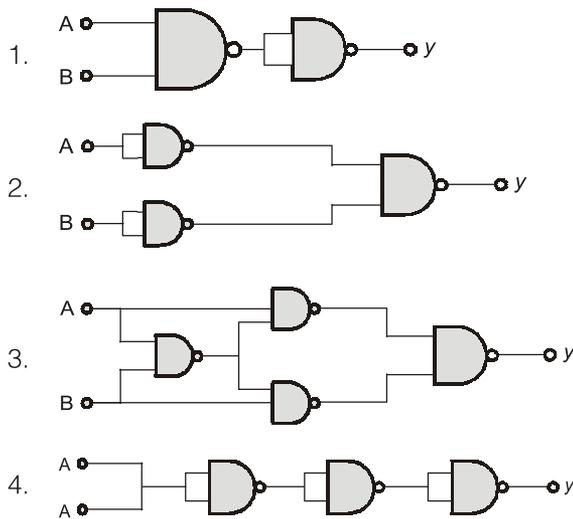
- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 2 | 1 | 4 | 3 |
| (b) | 1 | 2 | 4 | 3 |
| (c) | 2 | 1 | 3 | 4 |
| (d) | 3 | 4 | 2 | 1 |

70. Match List-I with List-II

List-I

- A. NOT GATE
- B. AND GATE
- C. OR GATE
- D. EX-OR Gate

List-II



Choose the correct answer from the options given below:

- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 1 | 3 | 4 | 2 |
| (b) | 2 | 1 | 3 | 4 |
| (c) | 4 | 1 | 2 | 3 |
| (d) | 2 | 3 | 4 | 1 |

71. Match List-I with List-II

List-I

- A. Direct memory addressing data memory
- B. Immediate Addressing
- C. Flag Manipulation
- D. Control transfer

List-II

- 1. MOV [SI], 2500 H
- 2. PUSHF
- 3. RET
- 4. MOV BX, [2000 H]

Choose the correct answer from the options given below:

- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 4 | 1 | 2 | 3 |
| (b) | 1 | 4 | 3 | 2 |
| (c) | 4 | 3 | 2 | 1 |
| (d) | 1 | 3 | 2 | 4 |

72. Match List-I with List-II

List-I

- A. Uniformly illuminated linear Array
- B. Uniformly illuminated circular aperture
- C. Optimum E-plane rectangular horn
- D. Optimum H-plane rectangular horn

List-II

- 1. $\frac{58}{D_\lambda}$
- 2. $\frac{56}{a_{E\lambda}}$
- 3. $\frac{67}{a_{E\lambda}}$
- 4. $\frac{51}{L_\lambda}$

- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 1 | 3 | 2 | 4 |
| (b) | 2 | 1 | 3 | 4 |
| (c) | 3 | 1 | 4 | 2 |
| (d) | 4 | 1 | 2 | 3 |

73. Match List-I with List-II

List-I

- A. Power of Am Wave
- B. Power of V_{SB}
- C. Power of SSB
- D. Power of DSBSC

List-II

- 1. $P_c \left(\frac{m^2}{4} \right)$
- 2. $\frac{m^2}{4} P_c + F \left(\frac{m^2}{4} P_c \right)$
- 3. $\frac{m^2}{4} \left(\frac{V_c^2}{2R} \right) + \frac{m^2}{4} \left(\frac{V_c^2}{2R} \right)$
- 4. $\frac{V_{carr}^2}{R} + \frac{V_{SB}^2}{R} + \frac{V_{USB}^2}{R}$

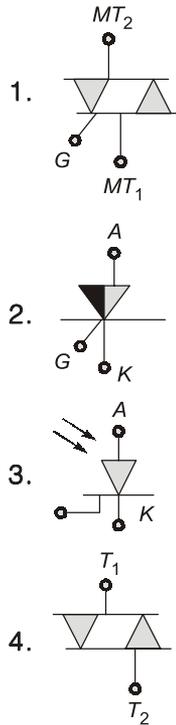
Choose the correct answer from the options given below:

- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 4 | 3 | 2 | 1 |
| (b) | 4 | 3 | 1 | 2 |
| (c) | 4 | 2 | 1 | 3 |
| (d) | 4 | 1 | 3 | 2 |

74. Match List-I with List-II

- List-I**
- A. DIAC
 - B. TRIAC
 - C. ASCR
 - D. LASCR

List-II



- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 2 | 3 | 4 | 1 |
| (b) | 4 | 1 | 2 | 3 |
| (c) | 4 | 2 | 3 | 1 |
| (d) | 1 | 4 | 2 | 3 |

75. Match List-I with List-II

- List-I**
- A. Relative error
 - B. Precision
 - C. Calibration
 - D. Resolution

- List-II**
1. The ability of the device to give identical O/P when repeated measurements are made with the same I/P signal.
 2. The ratio of difference between measured value and the true value to the true value of the measurand.
 3. The smallest increment in measure that can be detected with certainty by the instrument.

4. The process of making adjustments or the scale so that the instrument reading confirm to an accepted standard.

Choose the correct answer from the options given below:

- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 3 | 4 | 1 | 2 |
| (b) | 3 | 1 | 4 | 2 |
| (c) | 1 | 4 | 3 | 2 |
| (d) | 2 | 1 | 4 | 3 |

76. Atomic numbers for the following semiconducting and doping materials like Ga, In, As, Sb are respectively:

- | | |
|-------|-------|
| 1. 33 | 2. 49 |
| 3. 31 | 4. 51 |

Choose the correct answer from the options given below:

- | | |
|-------------------|-------------------|
| (a) 2 → 3 → 4 → 1 | (b) 1 → 4 → 2 → 3 |
| (c) 3 → 1 → 2 → 4 | (d) 3 → 2 → 1 → 4 |

77. The correct design flow of VLSI is:

1. Functional Design and verification
2. Circuit Design and verification
3. Logic Design and verification
4. Physical Design
5. Layout verification

Choose the correct answer from the options given below:

- | | |
|-------------------|-------------------|
| (a) 1, 2, 3, 4, 5 | (b) 1, 3, 2, 4, 5 |
| (c) 1, 4, 2, 3, 5 | (d) 1, 5, 4, 3, 2 |

78. Write them in descending order of measurement units

- | | |
|---------|----------|
| 1. atto | 2. tera |
| 3. Kilo | 4. micro |
| 5. pico | |

Choose the correct answer from the options given below:

- | | |
|-------------------|-------------------|
| (a) 2, 4, 3, 5, 1 | (b) 1, 2, 3, 4, 5 |
| (c) 2, 1, 3, 4, 5 | (d) 1, 5, 4, 3, 2 |

79. The correct flow in the basic block diagram of op-Amp is

1. Complementary symmetry push pull amplifier block.
2. Dual input unbalanced output differential amplifier block
3. Emitter follower with constant current source block
4. Dual-Input balanced output differential amplifier block

Choose the correct answer from the options given below:

- (a) $2 \rightarrow 4 \rightarrow 3 \rightarrow 1$ (b) $4 \rightarrow 2 \rightarrow 1 \rightarrow 3$
 (c) $4 \rightarrow 2 \rightarrow 3 \rightarrow 1$ (d) $2 \rightarrow 4 \rightarrow 1 \rightarrow 3$

80. Steps followed to implement the minimum SOP form function are as follows because it is beneficial to minimise the given logic to minimum SOP for PLA.

1. Mark the input connections of AND Matrix to generate the required product terms.
2. Mark the connections required for invert/non invert matrix for setting an active high to active low output
3. Prepare a PLA program table format indicating inputs, product terms and outputs.
4. Mark the input connections of OR matrix to generate the required output (sum) terms.

Choose the correct answer from the options given below:

- (a) 3, 4, 2, 1 (b) 1, 3, 4, 2
 (c) 3, 1, 4, 2 (d) 1, 2, 4, 3

81. Arrange following interrupts in order of polling (checking interrupt conditions) after every instructions.

1. Serial Interrupt
2. External 1 Interrupt
3. Timer 1 Interrupt
4. External 0 Interrupt

Choose the correct answer from the options given below:

- (a) 1, 4, 2, 3 (b) 4, 2, 3, 1
 (c) 4, 3, 1, 2 (d) 1, 3, 4, 2

82. Arrange the following in descending orders of Energy gaps of semiconductor Materials.

1. Si
2. Ge
3. GaAs
4. GaP

Choose the correct answer from the options given below:

- (a) 4, 3, 1, 2 (b) 2, 1, 3, 4
 (c) 1, 2, 4, 3 (d) 3, 2, 4, 1

83. Arrange the following materials in increasing order of refractive Index

1. Diamond
2. Water
3. Air
4. Vacuum

Choose the correct answer from the options given below:

- (a) 1, 3, 2, 4 (b) 4, 2, 3, 1
 (c) 3, 4, 1, 2 (d) 2, 1, 4, 3

84. Arrange the following in ascending order of their dielectric constant:

1. Alcohol
2. Nylon
3. Water (dehydrated)
4. Water (Fresh)

Choose the correct answer from the options given below:

- (a) 4, 3, 1, 2 (b) 3, 2, 1, 4
 (c) 2, 3, 1, 4 (d) 4, 1, 2, 3

85. Followings is the sequence of blocks in spectrum Analyser:

1. Detector and video Amplifier
2. Fixed Frequency Active filter
3. Attenuator (Adjustable)
4. Mixer and Tunable Detector

Choose the correct answer from the options given below:

- (a) $2 \rightarrow 4 \rightarrow 3 \rightarrow 1$ (b) $4 \rightarrow 2 \rightarrow 1 \rightarrow 3$
 (c) $1 \rightarrow 2 \rightarrow 4 \rightarrow 3$ (d) $3 \rightarrow 4 \rightarrow 2 \rightarrow 1$

86. Given below are two statements:

Statement I : Concentration of acceptor atoms in the region between isolation islands in a monolythic integrated circuit will be much higher than in a p-type substrate.

Statement II : The higher density is provided to prevent the depletion region of the reverse biased isolation to substrate junction from extending into the p⁺ type material.

In the light of the above statements, choose the most appropriate answer from the options given below :

- (a) Both Statement I and Statement II are correct
- (b) Both Statement I and Statement II are incorrect
- (c) Statement I is correct but Statement II is incorrect
- (d) Statement I is incorrect but Statement II is correct

87. Given below are two statements:

Statement I : In case a reverse biased photodiode is kept in a open light, the current flowing through the device corresponds to value of reverse saturation current.

Statement II : Photovoltaic emf of semiconductor photodiode is that voltage at which the resultant current flowing the device becomes zero.

In the light of the above statement, choose the most appropriate answer from the options given below :

- (a) Both Statement I and Statement II are correct
- (b) Both Statement I and Statement II are incorrect
- (c) Statement I is correct but Statement II is incorrect
- (d) Statement I is incorrect but Statement II is correct

88. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A : Some instruction read the contents of an internal port latch instead of reading the status of an external pin.

Reason R : We must not make a distinction between reading the status of the input pin and internal latch of the output port.

In the light of the above statements, choose the most appropriate answer from the options given below :

- (a) Both A and R are correct and R is the correct explanation of A
- (b) Both A and R are correct but R is NOT the correct explanation of A
- (c) A is correct but R is not correct
- (d) A is not correct but R is correct

89. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A: M-ary modulation scheme is preferable where bandwidth requirement is important.

Reason R: In M-ary modulation scheme the BW (bandwidth) requirement is reduced by factors $\log_2 M$ in comparison to BPSK system.

In the light of the above statements, choose the most appropriate answer from the options given below:

- (a) Both A and R are correct and R is the correct explanation of A.
- (B) Both A and R are correct but R is NOT the correct explanation of A
- (c) A is correct but R is not correct
- (d) A is not correct but R is correct

90. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R
Assertion A: Potentiometric type accelerometer have higher resolution than LVDT accelerometer.

Reason R: The resistance offered to the motion is less in LVDT accelerometer than in potentiometric accelerometer.

In the light of the above statements, choose the most appropriate answer from the options given below:

- (a) Both A and R are correct and R is the correct explanation of A
- (b) Both A and R are correct but R is NOT the correct explanation of A
- (c) A is correct but R is not correct
- (d) A is not correct but R is correct

Read the following paragraph and answer the five questions (91 to 95) that follow:

A pulse radar determines target by round trip time of a pulsed microwave signal. The frequency used by radar transmitter is 10 GHz with transmitted power 2KW (Pulse power). The Antenna size of radar transmitted this signal

is based on $\left(\lambda (\text{Wavelength}) = \frac{C (\text{speed of light})}{f (\text{Frequency})} \right)$

with a Gain (G_t) of 28 dB is used to detect the target (aeroplane) having its cross section area as 12 m². The receiver has its capability as -90dBm as minimum detectable signal (P_{\min}). There is an isolation between trans and receive chain as (80 – 100 dB) determine Radar maximum range.

91. What is the distance (R) of target if round trip time (t) is known in the radar signal C velocity of signal (EM wave)

- (a) $R = \frac{CT}{2}$
- (b) $R = \frac{CT}{4}$
- (c) $R = \frac{CT}{3}$
- (d) $R > \frac{CT}{2}$

92. Operating frequency of this radar falls in which band? Specify it

- (a) L-Band
- (b) C-Band
- (c) X-Band
- (d) Ku-Band

93. If Z_L is impedance of radar antenna and Z_0 is characteristic impedance of line, then what is reflection coefficient (Γ) of the antenna?

- (a) $\Gamma = \frac{Z_L - Z_0}{Z_L + Z_0}$
- (b) $\Gamma = \frac{Z_L + Z_0}{Z_L - Z_0}$
- (c) $\Gamma > \frac{Z_L - Z_0}{Z_L + Z_0}$
- (d) $\Gamma > \frac{Z_L + Z_0}{Z_L - Z_0}$

- 94.** Express minimum detectable Signal (P_{\min}) in watts (P_{\min} in radar receiver)
- (a) 10^{-12} W (b) 10^{-10} W
(c) 10^{-13} W (d) 10^{-9} W
- 95.** What is maximum range of this radar (R_{\max}) upto which target can be determined?
- (a) 8114 m (b) 6000 m
(c) 7414 m (d) 7500 m

Read the paragraph carefully and answer the questions (96 to 100) based on it.

In phase control and Integral cycle control the supply voltage is ac and the armature voltage is rectified ac, where as in chopper control the supply is dc and the average armature voltage is proportional to the duty ratio of the chopper. The chopper system is used for dc traction and battery operated vehicle - Choppers using thyristors are more complicated than the phase control system. This is because an auxiliary commutation arrangement is more complicated than the phase control system. This is because an auxiliary commutation arrangement is necessary for choppers, whereas commutation is natural owing to a.c. supply in phase control or integral cycle control.

- 96.** In a full controlled three phase bridge without fly wheel operation the displacement factor and power factor is:
- (a) $\cos \frac{\alpha}{2}, \sin 2\alpha$ (b) $\cos \alpha \frac{3}{\pi}, \cos \alpha$
(c) $\cos(90 - \alpha), \cos \alpha$ (d) $\cos 2\alpha, \frac{1}{\pi}, \cos 3\alpha$

- 97.** In a two quadrant signal phase SCR Drive armature current becomes continuous when:
- (a) $\beta - \alpha$ is equal to or greater than 180°
(b) $\beta - \alpha$ is less than 90°
(c) $\beta - \alpha$ is greater than 90° but less than 120°
(d) $\beta - \alpha$ is less than 45°

- 98.** In one quadrant converters such as half controlled bridge circuit or single phase circuit with fly wheel diodes for DC motor.
- (a) Average output voltage is always positive
(b) Average output voltage is always negative
(c) Torque is always negative
(d) Regeneration is always possible

- 99.** Filter for chopper should be designed such a way in the DC Drive that the chopper operating frequency should be at least.
- (a) 2 times resonant frequency
(b) $\frac{1}{2}$ times resonant frequency
(c) 4 times resonant frequency
(d) Same as resonant frequency

- 100.** In a single quadrant chopper how can the direction of dc motor be reversed
- (a) by changing the field
(b) by changing the direction of free wheeling diode
(c) by changing the chopper frequency
(d) by applying filter



Answers UGC NET : 2022 (Exam held on 22nd February, 2023)

1. (b) 2. (c) 3. (c) 4. (d) 5. (a) 6. (d) 7. (b) 8. (d) 9. (b) 10. (b)
11. (c) 12. (a) 13. (b) 14. (d) 15. (d) 16. (a) 17. (a) 18. (b) 19. (b) 20. (b)
21. (a) 22. (b) 23. (c) 24. (d) 25. (b) 26. (d) 27. (c) 28. (d) 29. (d) 30. (b)
31. (d) 32. (d) 33. (d) 34. (c) 35. (d) 36. (*) 37. (b) 38. (c) 39. (b) 40. (*)
41. (*) 42. (*) 43. (b) 44. (a) 45. (c) 46. (a) 47. (b) 48. (d) 49. (a) 50. (b)
51. (*) 52. (b) 53. (d) 54. (b) 55. (c) 56. (a) 57. (b) 58. (b) 59. (b) 60. (b)
61. (c) 62. (a) 63. (a) 64. (b) 65. (a) 66. (a) 67. (c) 68. (d) 69. (b) 70. (c)
71. (a) 72. (d) 73. (d) 74. (b) 75. (d) 76. (d) 77. (b) 78. (*) 79. (c) 80. (d)
81. (*) 82. (a) 83. (*) 84. (*) 85. (d) 86. (a) 87. (a) 88. (c) 89. (b) 90. (a)
91. (a) 92. (c) 93. (a) 94. (a) 95. (a) 96. (b) 97. (a) 98. (a) 99. (c) 100. (a)



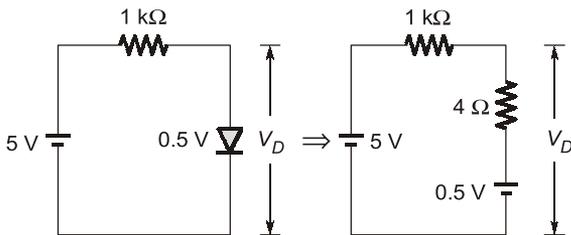
Explanations UGC NET : 2022 (Exam held on 22nd February, 2023)

1. (b)

In the photodiode, a very small reverse. Current flows through the device that's termed as dark current so because this current is totally the result of the flow of minority carriers and is thus flows when the device is not exposed to radiation.

2. (c)

Given diode is



$$I_D = ?$$

$$V_D = ?$$

$$R_f = 4 \Omega$$

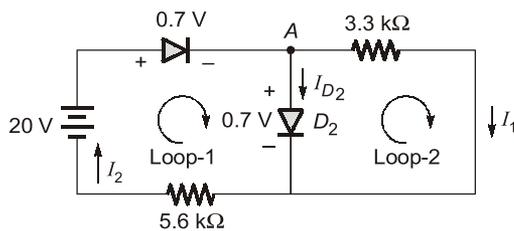
$$I_D = \frac{5 - 0.5}{1004} = 4.482 \text{ mA}$$

$$\begin{aligned} V_D &= 4I_D + 0.5 \\ &= 4 \times 4.482 \times 10^{-3} + 0.5 \\ &= 0.518 \text{ V} \approx 0.52 \text{ V} \end{aligned}$$

$$I_D = 4.482 \text{ mA}$$

$$V_D = 0.52 \text{ V}$$

3. (c)



KCL at node A,

$$I_2 = I_{D2} + I_1 \quad \dots(i)$$

KVL in loop-1

$$-20 + 0.7 + 0.7 + 5.6I_2 = 0$$

$$I_2 = \frac{20 - 1.4}{5.6} = 3.321 \text{ mA}$$

KVL in loop-2,

$$-0.7 + 3.3I_1 = 0$$

$$I_1 = \frac{0.7}{3.3} = 0.2121 \text{ mA}$$

From equation (i)

$$I_{D2} = I_2 - I_1 = 3.321 - 0.212$$

$$I_{D2} = 3.108 \text{ mA}$$

$$\approx 3.11 \text{ mA}$$

4. (d)

Ripple Rejection Ratio (RRR) of voltage regulation

$$= \frac{\text{Input ripple voltage}}{\text{Output ripple voltage}}$$

It is also called as PSRR (Power Supply Rejection Ratio) or input voltage ripple rejection. It is depending on the ripple frequency.

5. (a)

In linear region, the gate capacitance is distributed equally between C_{gs} and C_{gd} while in saturation, almost all of the channel charge is controlled by the

source, i.e. $C_{gd} = 0$, while $C_{gs} = \frac{2}{3} C_{ox} \times L \times W$.

7. (b)

n -channel MOS transistor,

$$\mu_n = 600 \text{ cm}^2/\text{Vs}$$

$$C_{ox} = 7 \times 10^{-8} \text{ F/cm}^2$$

$$W = 40 \mu\text{m}$$

$$L = 4 \mu\text{m}$$

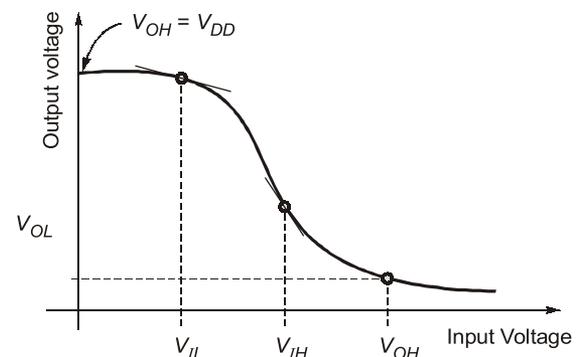
$$V_{TO} = 1 \text{ V}$$

$$K \text{ parameter} = \mu_n C_{ox} \frac{W}{L}$$

$$= 600 \times 7 \times 10^{-8} \times \frac{40}{4}$$

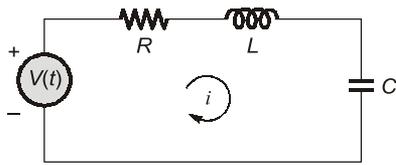
$$= 4.2 \times 10^{-4} = 42 \times 10^{-5} \text{ A/V}^2$$

8. (d)



Critical voltage, $V_{OH} = V_{DD} = 5 \text{ Volt}$

9. (b)



Kirchhoff's voltage law,

$$V(t) = Ri(t) + L \frac{di(t)}{dt} + \frac{1}{C} \int i(t) dt$$

$$V(t) = Ri + L \frac{di}{dt} + \frac{1}{C} \int i dt$$

10. (b)

Unit parabolic function = $\frac{t^2}{2} u(t)$

Laplace transform = $\frac{1}{s^3}$

11. (c)

Two port network:



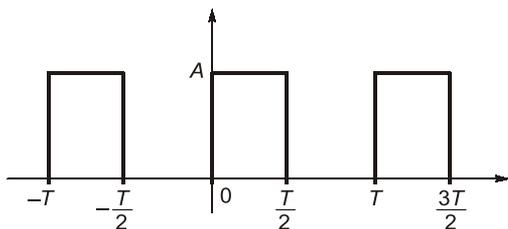
Transmission parameter is

$$V_1 = AV_2 - BI_2$$

$$I_1 = CV_2 - DI_2$$

12. (a)

Fourier series of wave



$$a_0 = \frac{1}{T} \int_0^T f(t) dt$$

$$\Rightarrow \frac{1}{T} \int_0^T A dt = \frac{A}{2}$$

$$a_n = \frac{2}{T} \int_0^T f(t) \cos n\omega_0 t dt = \frac{2}{T} \int_0^{T/2} A \cos n\omega_0 t dt$$

$$= \frac{2}{T} A \frac{\sin n\omega_0 t}{n\omega_0} \Big|_0^{T/2}$$

$$\Rightarrow \frac{2A}{T} \frac{\sin n \frac{2\pi}{T} \times \frac{T}{2}}{n \frac{2\pi}{T}} = \frac{A}{n\pi} \sin n\pi$$

$$= 0 ; n = 0, 1, 2, 3 \dots$$

$$b_n = \frac{2}{T} \int_0^T f(t) \sin n\omega_0 t dt$$

$$\Rightarrow = \frac{2}{T} \int_0^{T/2} A \sin n\omega_0 t dt$$

$$\Rightarrow \frac{2A}{T} \left[-\frac{\cos n\omega_0 t}{n\omega_0} \right]_0^{T/2}$$

$$\Rightarrow \frac{A}{n\pi} [1 - (-1)^n]$$

$$n = 1 ; b_n = \frac{2A}{\pi}$$

$$n = 3 ; b_n = \frac{2A}{3\pi}$$

$$n = 5 ; b_n = \frac{2A}{5\pi}$$

$$f(t) = \frac{A}{2} + \frac{2A}{\pi} \left[\sin(\omega_0 t) + \frac{1}{3} \sin(3\omega_0 t) + \dots \right]$$

13. (b)

A transistor is said to be in the quiescent state when no signal is applied to the input. When direct current is applied to the base of a transistor to bias it, the transistor enters the quiescent state. This is a state of inactivity or quiescent.

15. (d)

Op-amp, $V_1 = 745 \mu V$

$V_2 = 740 \mu V$

$A_{dm} = 5 \times 10^5$

CMRR = 100 dB

$$\Rightarrow \text{CMRR} = 10^{\frac{100}{20}} = 10^5$$

$V_o = ?$

$$\text{CMRR} = \frac{A_{dm}}{A_{cm}} = 10^5$$

$$A_{cm} = \frac{A_{dm}}{10^5} = \frac{5 \times 10^5}{10^5} = 5$$

$$V_o = A_{dm} V_{dm} + A_{cm} V_{cm}$$

$$V_{dm} = V_1 - V_2 = 745 - 740 = 5 \mu V$$

$$V_{cm} = \frac{V_1 + V_2}{2} = \frac{745 + 740}{2} = 742.5 \mu V$$