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UGC-NET Previous Solved Papers : Electronic Science

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Preface

B. Singh (Ex. IES)

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.

With Best Wishes

B. Singh (Ex-IES)

CMD, MADE EASY Group

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1 CHAPTER

UGC NET : 2012 (Paper-II)

(Exam held in June, 2012)

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*.

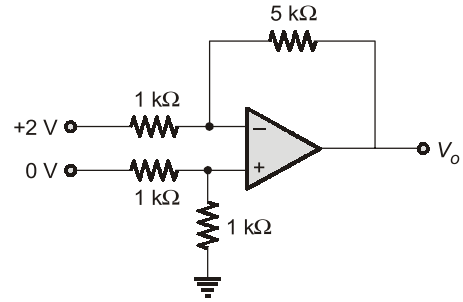
2. The increase in temperature, the electrical conductivity would
(a) increase in metals as well as increase in semiconductors
(b) increase in metals but decrease in semiconductors
(c) decrease in metals but increase in semiconductors
(d) decrease in metals as well as in semiconductors

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) Instructor 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) $\vec{S} = \frac{1}{\mu_o}(\vec{E} \times \vec{B})$ (b) $\vec{S} = (\vec{E} \times \vec{B})$

(c) $\vec{S} = \mu_o(\vec{E} \times \vec{B})$ (d) $\vec{S} = \frac{1}{\epsilon_o}(\vec{E} \times \vec{B})$

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) ≤ 10 μm (b) 50 μm
(c) 100 μm (d) 200 μm

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.

26. **Assertion (A):** The top down structured programming should be used for developing programmes.

Reason (R): The top down structured programming methodology enables us to get readable and easily provable program.

27. **Assertion (A):** Stimulated emission is the key to the operation of LASER.

Reason (R): Animportant property of laser radiation is its coherence, under which is meant the correlation between the phases of oscillation at different positions in space and at various moments of time.

28. **Assertion (A):** An half adder is faster than full-adder.

Reason (R): An half adder gives only one output while a full adder gives two outputs.

29. **Assertion (A):** A programmable Read-Only-Memory can be used as a synchronous counter.

Reason (R): Eachmemory location of a programmable Read-Only-Memory is programmed and can be read synchronously.

30. **Assertion (A):** In PCM a message signal is represented by a sequence of coded pulses, which is accomplished by representing the signal in discrete form in both time and amplitude.

Reason (R): The signal encoded in the form of quantized samples which translates into a coded number.

31. Consider the following circuit configurations:

1. Common emitter
2. Common base
3. Emitter follower
4. Emitter follower using Darlington pair

The correct sequence in increasing order of the input resistances of these configurations is

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

32. Digital measuring instruments use the following types of A to D converters:

1. Dual slope Type
2. Counter Type
3. Flash Type

The correct sequence for these converters in decreasing order of their speed (fastest to slowest) is

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

33. Consider the following logic families:

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

The sequence of the logic families in the order of their increasing noise margin is

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

34. Consider the following communication systems:

1. FM Broadcast
2. AM Broadcast
3. Microwave Communication
4. Optical Fiber Communication

The sequence of the communication systems in the order of their increasing carrier frequency is

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

35. The highest data rate can be transmitted using following cables:

1. Co-axial cable
2. Twisted-wire cable
3. Optical fiber cable

The correct sequence in the increasing order is

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

36. Match **List-I** with **List-II** and select the correct answer by using the codes given below the lists:

	List-I		**List-II**
A.	LASER	**1.**	Spontaneous emission
B.	Solar cell	**2.**	Consumes electrical power due to the incident light
C.	Photo diode	**3.**	Delivers power to a load
D.	LED	**4.**	Stimulated emission

Codes:

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

37. Match **List-I** with **List-II** and select the correct answer by using the codes given below the lists:

	List-I		**List-II**
A.	BJT	**1.**	Pinch off effect
B.	FET	**2.**	Controlled rectification
C.	SCR	**3.**	Negative resistance characteristics
D.	Tunnel diode	**4.**	Punch through effect

Codes:

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

38. Match **List-I** with **List-II** and select the correct answer by using the codes given below the lists:

List-I	**List-II**
A. Ampere's law	**1.** Force on a charge
B. Biot's law	**2.** Force due to a current carrying conductor
C. Coulomb's law	**3.** Electric flux density at a point
D. Gauss's law	**4.** Magnetic flux density at a point

Codes:

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

39. Match **List-I** with **List-II** and select the correct answer by using the codes given below the lists:

List-I	**List-II**
A. Parallel comparator	**1.** *n*-bits conversion time
B. Successive approximation	**2.** Fastest converter
C. Dual slope	**3.** Voltage dependent conversion type
D. Counter type	**4.** Integrating type

Codes:

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

40. Match **List-I** with **List-II** and select the correct answer by using the codes given below the lists:

List-I	**List-II**
A. Frequency modulation	**1.** Envelope detection
B. Double sideband suppressed	**2.** Companding suppressed
C. PCM	**3.** Balance modulator
D. Amplitude modulation	**4.** Pre-emphasis and de-emphasis

Codes:

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

41. Match **List-I** with **List-II** and select the correct answer by using the codes given below the lists:

List-I	**List-II**
A. LVDT	**1.** Pressure
B. Bourdon tube	**2.** Temperature
C. Strain gauge	**3.** Displacement
D. Thermistor	**4.** Stress

Codes:

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

42. Match **List-I (Flags)** with **List-II (Bit position)** and select the correct answer by using the codes given below the lists:

List-I	**List-II**
A. Sign flag	**1.** 4^{th} bit
B. Parity	**2.** 6^{th} bit
C. Zero	**3.** 2^{nd} bit
D. Auxiliary	**4.** 7^{th} bit

Codes:

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

43. Match **List-I** with **List-II** and select the correct answer by using the codes given below the lists:

List-I	**List-II**
A. Gunn diode	**1.** Junctionless device
B. Solar cell	**2.** Single junction device
C. MOSFET	**3.** Double junction device
D. SCR	**4.** Triple junction device

Codes:

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

44. Match **List-I** with **List-II** and select the correct answer by using the codes given below the lists:

List-I

A. Monostable multivibrator
B. Astable multivibrator
C. Schmitt trigger
D. Bistable multivibrator

List-II

1. Quasi stable state
2. One stable state
3. Two stable state
4. No stable state

Codes:

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

45. Match **List-I** with **List-II** and select the correct answer by using the codes given below the lists:

List-I

A. Semi-conductor memory
B. Ferrite core memory
C. Magnetic tape memory
D. Flash memory

List-II

1. Destructive read out
2. Combinational logic
3. Non-volatile
4. EEPROM

Codes:

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

Read the paragraph and answer the question **46 to 50**:

Noise may be defined, in an electrical sense, as an unwanted form of energy tending to interfere with the proper and easy reception and reproduction of wanted signals. Many disturbances of the electrical nature produce noise in receiver, modifying the signal in an unwanted manner. Noise is divided into two groups. Noise whose sources are external to the receiver and other one is noise created within the receiver itself. Various forms of noise created outside the receiver i.e. external noise includes atmospheric and extra-terrestrial noise and industrial noise. Atmospheric noise becomes less severe at frequencies above 30 MHz. Extra-terrestrial noises are solar noise and cosmic noise. They radiate over a very broad frequency spectrum which includes the frequencies, we use for communication. These disturbances are at the eruption of corona flares and sunspots. The noise generated is due to the random motion of electrons, atoms and molecules. Kinetic theory states that the temperature of the system increases due to the motion of the particles.

46. In a communication system, noise is most likely to affect the signal
(a) at a transmitter
(b) in a channel
(c) in the information source
(d) at the destination

47. Indicate the false statement.
(a) HF mixers are generally noiser than HF amplifiers.
(b) Impulse noise voltage is independent of bandwidth.
(c) Thermal noise is independent of the frequency at which it is measured.
(d) Industrial noise is usually of the impulse type.

48. The value of a resistor creating thermal noise is doubled. The noise power generated is therefore
(a) halved (b) quadrupled
(c) doubled (d) unchanged

49. One of the following is not a useful quantity for comparing the noise performance of receivers:
(a) Input noise voltage
(b) Equivalent noise resistance
(c) Noise temperature
(d) Noise figure

50. Indicate the noise whose source is in a category different from that of the other three.
(a) Solar noise
(b) Cosmic noise
(c) Atmospheric noise
(d) Galactic noise

■■■■

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).

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

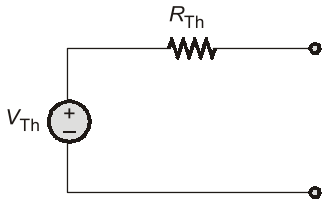
2. (c)

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.

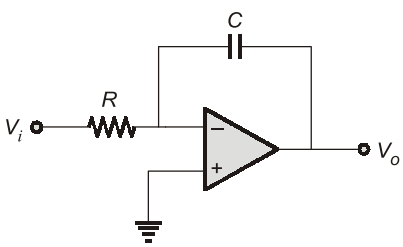
4. (d)

Thevenin's theorem:



5. (b)

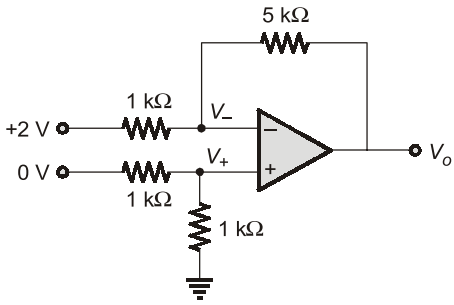
Op-amp integrator can be drawn as,



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

6. (a)

Given op-amp circuit,



Since it is an ideal op-amp,

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

At inverting terminal,

$$\frac{V_- - 2}{1\text{k}\Omega} + \frac{V_- - V_o}{5\text{k}\Omega} = 0$$
$$5V_- - 10 + V_- - V_o = 0$$
$$6V_- - 10 = V_o$$
$$\therefore \quad V_o = -10\text{ V}$$

7. (c)

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

$$2^n \le 1024$$
$$\therefore \quad n = 10$$

8. (c)

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

31 CHAPTER

UGC NET : 2022

(Exam held on 22nd February, 2023)

1. In case a reverse biased photodiode is kept in dark condition, the current flowing through the device corresponds to:

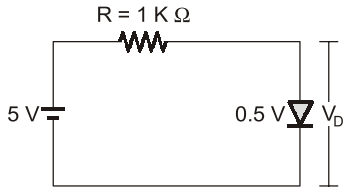
(a) Maximum value of current which can flow through the device

(b) Value of reverse saturation current

(c) Normal value of current'

(d) 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.



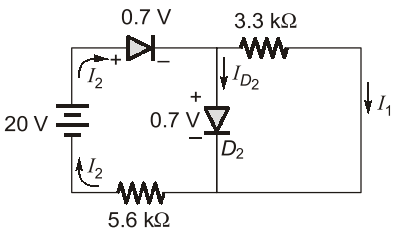
(a) I_D = 4.521 mA, V_D = 0.45 V

(b) I_D = 4.621 mA, V_D = 0.48 V

(c) I_D = 4.482 mA, V_D = 0.52 V

(d) 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.



(a) 1.12 mA (b) 2.11 mA

(c) 3.11 mA (d) 4.11 mA

4. The ratio of peak to peak input ripple voltage to peak to peak ripple output voltage is known as:

(a) Ripple Voltage

(b) Ripple Current

(c) Ripple gain or Ripple Factor

(d) Ripple rejection

5. Approximate oxide capacitance value (C_{gd}) for saturation operating mode of MOS transistor is:

(a) 0 (b) $C_{ox}\,WL$

(c) $C_{ox}\,W.L_D$ (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:

(a) n^+/p^+ (b) n^+/p

(c) n/p^+ (d) n/p

7. For an n-channel MOS transistor with μ_n = 600 cm^2/Vs, C_{ox} = 7 x 10^{-8} F/cm^2, W = 40 μm, L = 4 μm and V_{TO} = 1.0 V the value of K parameter is:

(a) 0.28 mA/V^2 (b) 42 × 10^{-5} A/V^2

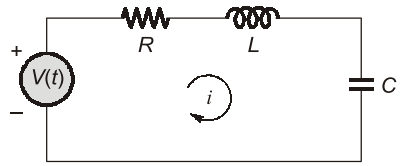
(c) 62 mA/V^2 (d) 36 mA/V^2

8. Consider a resistive load inverter with V_{DD} = 5 V, K^1n = 20 μA/V^2, V_{TO} = 0.7 V, R_L = 500 kΩ and $\frac{W}{L}$ = 3. Value of critical voltage V_{OH} is:

(a) 0 V (b) 0.147 V

(c) 0.925 V (d) 5 V

9. For series RLC circuit given below in figure, choose the correct answer based on Kirchhoff's voltage law from following:



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

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

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

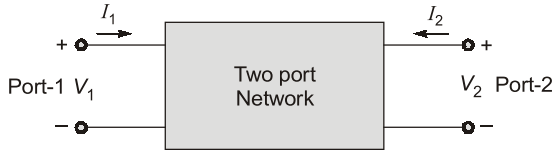
(d) $Ri + \frac{1}{L}\int i\,dt + \frac{1}{C}\int i\,dt = V(t)$

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



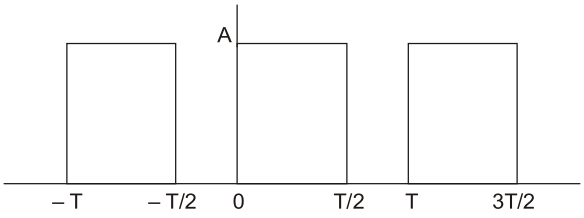
(a) $V_1 = Z_{11}I_1 + Z_{12}I_2$
$V_2 = Z_{21}I_1 + Z_{22}I_2$

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

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

(c) $f(t) = \frac{A}{4} + \frac{A}{\pi}[\sin(\omega_0 t) + \frac{1}{3}\sin(3\omega_0 t) + ...]$

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

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:

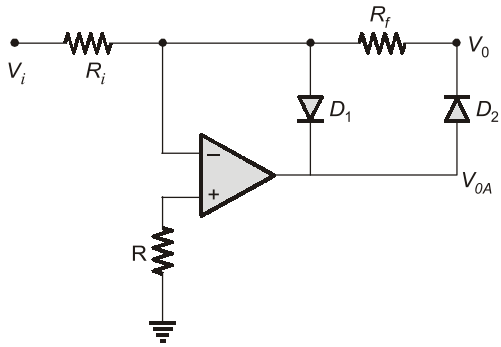
(a) $C_1 \cdot C_2$ (b) $C_1 + C_2$

(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 μV and 740 μV 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?

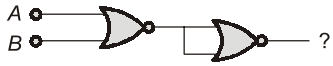


(a) Half wave rectification
(b) Full wave rectification
(c) Voltage Doubler circuit
(d) Peak detector circuit

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(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, 21FFEH (d) 31FFEH, 31FFFH

25. An Elliptical polarized wave has an electric field of $\vec{E} = \sin(\omega t - \beta z)\hat{a}_x + 2\sin(\omega t - \beta z + 75°)\hat{a}_y$ V/m.
The power per unit area conveyed by the wave in free space.
(a) 6.63 W/m^2 (b) 6.63 mW/m^2
(c) 16.63 mW/m^2 (d) 0.663 W/m^2

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 Magnetostics
(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 η_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

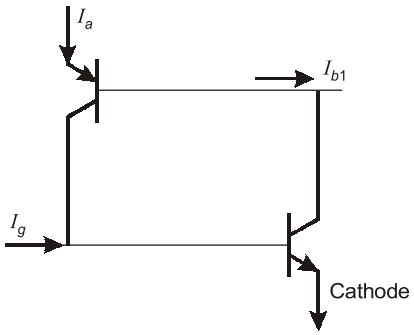
$s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$,

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) $\dfrac{\alpha_2 I_g}{1+\alpha_1-\alpha_2}$ (b) $\dfrac{\alpha_1 I_g}{1-\alpha_1+\alpha_2}$

(c) $\dfrac{\alpha_2 I_g}{\alpha_1+\alpha_2}$ (d) $\dfrac{\alpha_2 I_g}{1-(\alpha_1+\alpha_2)}$

36. Find the value of inductance in a series inverter circuit having the frequency of 5 kHz and a capacitance 1 μF. 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:

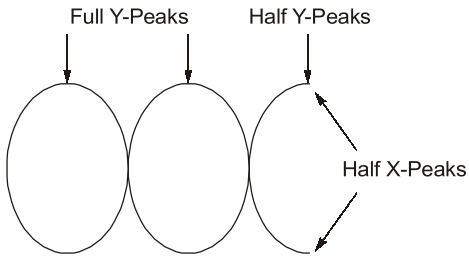
(a) Wheatstone Bridge

(b) Owen Bridge

(c) Schering Bridge

(d) Wein Bridge

39. For a Lissajous pattern as shown if 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:

1. The O/P frequency of a half wave rectifier is equal to the input frequency.
2. The O/P frequency of a full wave rectifier is double to the input frequency.
3. The regulation of an excellent rectifier should be zero.
4. 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.

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

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) β-α is equal to or greater than 180°
(b) β-α is less than 90°
(c) β-α is greater than 90° but less than 120°
(d) β-α 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)

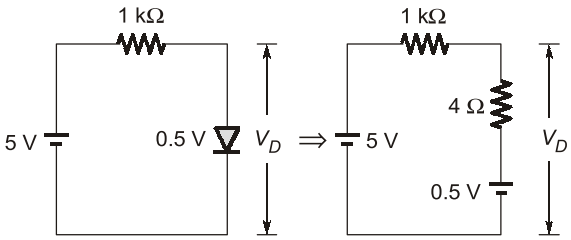
Explanations UGC NET : 2022 (Exam held on 22nd February, 2023)

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



$I_D = ?$

$V_D = ?$

$R_f = 4\ \Omega$

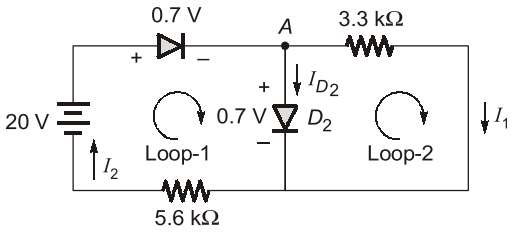
$$I_D = \frac{5-0.5}{1004} = 4.482\ \text{mA}$$

$$V_D = 4I_D + 0.5$$
$$= 4 \times 4.482 \times 10^{-3} + 0.5$$
$$= 0.518\ \text{V} \simeq 0.52\ \text{V}$$

$I_D = 4.482\ \text{mA}$

$V_D = 0.52\ \text{V}$

3. (c)



KCL at node A,

$$I_2 = I_{D_2} + I_1 \qquad \ldots(i)$$

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)

$$I_{D_2} = I_2 - I_1 = 3.321 - 0.212$$
$$I_{D_2} = 3.108\ \text{mA}$$
$$\simeq 3.11\ \text{mA}$$

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

7. (b)

n-channel MOS transistor,

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

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

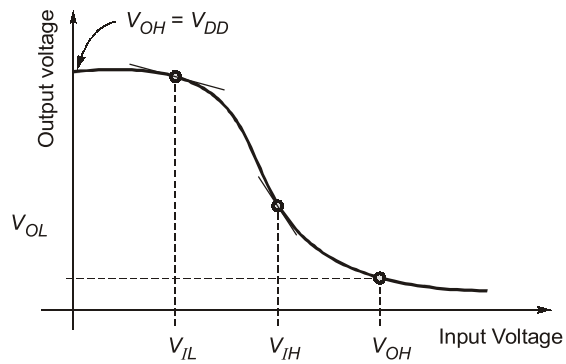
$W = 40\ \mu\text{m}$

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

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

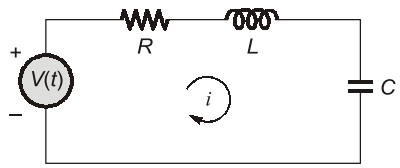
$$K \text{ parameter} = \mu_n C_{ox} \frac{W}{L}$$
$$= 600 \times 7 \times 10^{-8} \times \frac{40}{4}$$
$$= 4.2 \times 10^{-4} = 42 \times 10^{-5}\ \text{A/V}^2$$

8. (d)



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

9. (b)



Kirchhoff's voltage law,

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

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

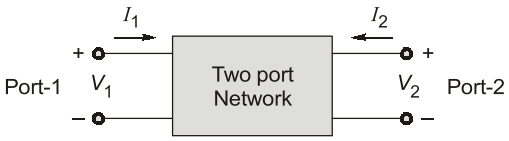
10. (b)

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

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

11. (c)

Two port network:

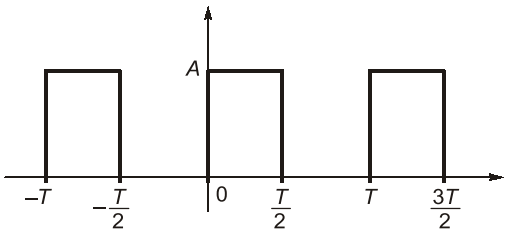


Transmission parameter is

$$V_1 = AV_2 - BI_2$$
$$I_1 = CV_2 - DI_2$$

12. (a)

Fourier series of wave



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

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

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

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

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

$$= 0 \quad ; \quad n = 0, 1, 2, 3 \ldots$$

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

$$\Rightarrow \quad = \frac{2}{T}\int_0^{T/2} A\sin\omega_o t\,dt$$

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

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

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

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

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

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

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, $V_1 = 745\ \mu V$

$V_2 = 740\ \mu V$

$Ad_m = 5 \times 10^5$

CMRR = 100 dB

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

$V_o = ?$

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

$$A_{cm} = \frac{A_{dm}}{10^5} = \frac{5\times10^5}{10^5} = 5$$

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

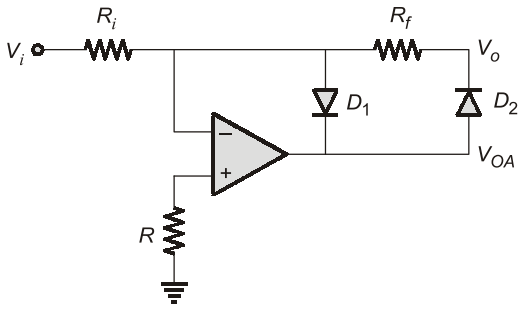
$$V_{dm} = V_1 - V_2 = 745 - 740 = 5\ \mu V$$

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

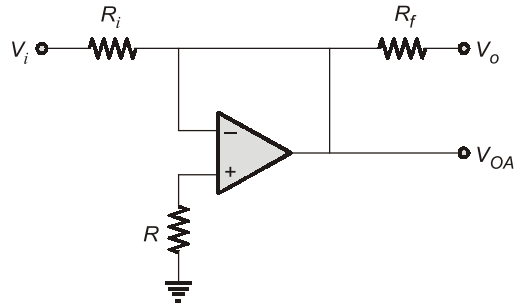
$$V_o = 5 \times 10^5 \times 5 \times 10^{-6} + 5 \times 742.5 \times 10^{-6}$$
$$= 2.5037 \simeq 2.57 \text{ V}$$

16. (a)

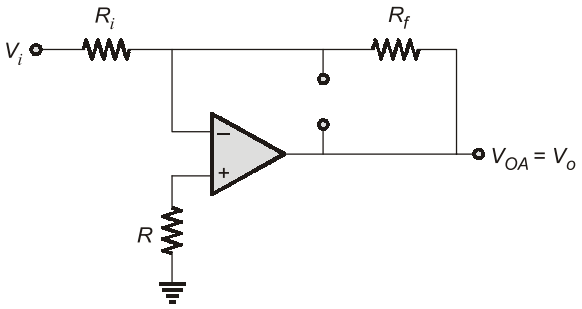
Given operational amplifier circuit,



V_i = +ve ; $V_{OA} = -V_c$
$D_1 \rightarrow$ ON ; $D_2 \rightarrow$ OFF



$V_o = 0$
V_i = –ve ; V_{OA} = +ve
$D_1 \rightarrow$ OFF ; $D_2 \rightarrow$ ON



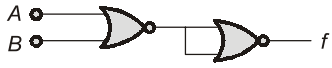
$$\frac{V_i - 0}{R_i} = \frac{0 - V_o}{R_f}$$

$$V_o = -\frac{R_f}{R_i} V_i$$

17. (a)

$$(0.125)_{10} = 0.125 \times 8 = 1$$
$$0.00 \times 8 = 0$$
$$= (0.100)_8$$

18. (b)



$$f = \overline{\overline{A+B}} = A + B$$

19. (b)

$$Y = \bar{A}BC + A\bar{B}C + AB\bar{C} + ABC$$

BC / A	00	01	11	10
0	0	0	1	0
1	0	1	1	1

$$Y = f(A, B, C) = \Sigma m(3, 5, 6, 7)$$

20. (b)

Truth table of *D*-flip-flop

C	D	Q_{n+1}
0	X	Q_n (Last sale)
↑	0	0
↑	1	1

$$Q_{n+1} = D_n$$

22. (b)

AL = 19 BCD
BL = 36 BCD
ADD AL, BL
DAA
AL ← 55H

0 0 0 1 1 0 0 1
0 0 1 1 0 1 1 0
0 1 0 0 1 1 1 1
Exceed 09

0 1 0 0 1 1 1 0
0 0 0 0 0 1 1 0
0 1 0 1 0 1 0 1
5 5

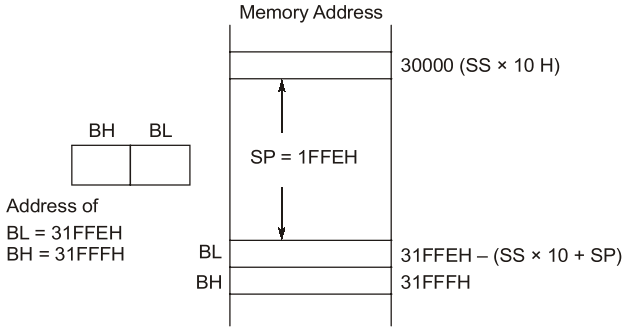
23. (c)

BIU 8086
16-bit segment registers.

- Data or word size = 16 bits
- Address bus size = 20 bits
- The number of address lives in 8086 is 20, 8086 BIU will send 20 bit address.

24. (d)

SS = 3000 H
SP = 2000 H
PUSH BX



(i) SP is decremented by 1 (i.e. SP = 1FFFH) and the content of BH register (Upper Byte of BX) is pushed into the offset address specified by SP in SS.

(ii) SP is again decremented by 1 (i.e. SP = 1FFEH) and the content of the BL register (Lower byte of BX) is pushed into the offset address specified by SP in the stack segment.

25. (b)

Elliptical polarized wave has an electric field.

$$\vec{E} = \sin(\omega t - \beta z)\,\hat{a}_x + 2\sin(\omega t - \beta z + 75°)\,\hat{a}_y \text{ V/m}$$

$$P_{avg} = \frac{1}{2\eta}E^2$$

$$E = \sqrt{2^2 + 1} = \sqrt{5}$$

$$E^2 = 5$$

$$P_{avg} = \frac{1\times 5}{2\times 120\pi} = 6.6314\times 10^{-3} \text{ W/m}^2$$

$$= 6.63 \text{ mW/m}^2$$

27. (c)

$$V = 2xyz^2$$

$$\text{grad } V = \frac{\partial}{\partial x}V + \frac{\partial}{\partial y}V + \frac{\partial}{\partial z}V$$

$$\text{grad } V = 2yz^2\hat{a}_x + 2xz^2\hat{a}_y + 4xyz\,\hat{a}_z$$

28. (d)

$$10\log p = 0 \text{ dBm}$$

$$\log p = \frac{0}{10} = 0$$

$$p = 10^0 \times 10^{-3}$$

$\Rightarrow$ 1 mW.

29. (d)

N.A. = 0.3
n_2 = 1.6
n_1 = ?

Numerical aperture = N.A. = 0.3

$$\sqrt{n_1^2 - n_2^2} = 0.3$$

$$n_1^2 - (1.6)^2 = 0.09$$

$$n_1^2 = 0.09 + 2.56 = 2.65$$

$$n_1 = \sqrt{2.65} = 1.627$$

$$n_1 = 1.627 \simeq 1.63$$

30. (b)

Coherent binary FSK.
Orthogonal sinusoidal

f_L = 20 kHz
f_H = 50 kHz

For orthogonal

$$f_H - f_L = \frac{n}{2T_b} \text{ ; for coherent detection}$$

$$50 - 20 = \frac{1}{2T_b}$$

$$T_b = \frac{1\times 10^{-3}}{2\times 30} = \frac{1000}{2\times 30}\times 10^{-6}$$

T_b = 16.67 μsec = 0.016 msec

31. (d)

Coherent detector.

32. (d)

For wideband FM.
Modulation index (β) > 1.

34. (c)

Given characteristics equation
$s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$
By Routh Hurwitz (R-H) criteria

s^6	1	8	20	16
s^5	2	12	16	
s^4	2	12	16	
s^3	8	24		
s^2	6	16		
s^1	$\frac{8}{3}$	0		
s^0	16			