



**PANACEA IES/GATE INSTITUTE**  
*Best Institute for Electronics & Communication*



# **PANACEA**

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# **IES 2011**

## **Detailed Solution**

### **ECE Paper – I & II**

### **Set - A**

# **IES-GATE-PSU**

*Exclusively For*

***Electronics & Communication***

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**IES-2011 Detailed solution Paper – I (Set-A)**

1. A. **Reference:** Refer Panacea EDC theory book page-105
2. D. It is just by definition of super conductor.
3. C. **Reference:** Discussed various type of unit cells in panacea classes
4. A. **Reference:** Refer Panacea EDC theory book page-105.
5. C. **Reference:** Refer Panacea Material theory book page-38.
6. D. **Reference:** Basic question
7. B. Mobility of electron is higher than mobility of holes because effective mass of electron is higher than effective mass of holes. **Reference:** Refer Panacea EDC theory book page-10&3.
8. C.  $R_e = 0.5 k\Omega$        $R_c = 5 k\Omega$        $\beta = 100$        $I_c = 1 mA$

$$A_v = \frac{-\beta \times R_c}{R_i} \qquad R_i = h_{ie} + (1 + h_{fe}) R_e$$

$$R_{ie} = \beta r_e = \beta \cdot \frac{V_T}{I_c} = \frac{100 \times 25}{1} = 2500 \Omega = 2.5 k\Omega$$

$$R_i = 2.5 + (101) \times 0.5 = 2.5 + 50.5 = 53 k\Omega$$

$$A_v = \frac{-100 \times 5}{53} \approx -10$$

**Reference:** Refer Panacea Analog theory book page-13 case-3

$$9. A. \quad A_v = \frac{-h_{fe} R_c}{R_i} \qquad R_i = h_{ie} + (1 + h_{fe}) R_L \qquad R_i = 2 K\Omega \qquad A_v = \frac{-100 \times 10}{2} = -500$$

**Reference:** Refer Panacea Analog theory book page-11 case-1

10. C. **Reference:** Refer Panacea material theory book .
11. B.
12. D. **Reference:** Refer Panacea material theory book page of classical theory of metals
13. A    14.B    15.A
16. C. **Reference:** Refer Book by William Shen-chie Chang Page-32
17. C. **Reference:** Refer Book Milliman and Taub
18. A. **Reference:** Refer Book Milliman and Taub
19. B. It is an example of voltage shunt. It is basic circuit of voltage shunt. Discussed at many places.

$$20. D. \quad Q = \frac{f_0}{B.W.} \qquad 60 = \frac{6}{B.W.}$$

B.W = 0.1 MHz = 100 KHz. It is basic formula. Discussed at many places.

$$21. B. \quad v_{drift} = \mu E \qquad 7000 \frac{cm}{sec} = \mu \times 10 \frac{volt}{cm} \Rightarrow \mu = 700 \frac{cm^2}{V \cdot sec}$$

**Reference:** For concept Refer Panacea Electronics device&circuit theory book page-10.

22. A. **Reference:** For Statement-2: Refer Electronic devices and circuits-principles and applications by Deshpande Page-59. For other statement refer Panacea Electronics device theory book page number- 5

$$23. D. \quad J_p = -qD_p \frac{dp}{dx} = -1.6 \times 10^{-19} \times \frac{-2 \times 10^{14}}{cm^3 / cm} \times 13 \frac{cm^2}{sec}$$

$$= -3.2 \times 13 \times 10^{-5} \text{ Amp} = 41.6 \times 10^{-5} \text{ A} \quad J_p = 0.416 \times 10^{-3} \text{ A} = 0.416 \text{ mA}$$

**Reference:** For concept refer Panacea Electronics device theory book page number- 14&15.

24. A.  $L_p^2 = D_p \tau_p$  but  $\frac{D_p}{\mu_p} = V_T$

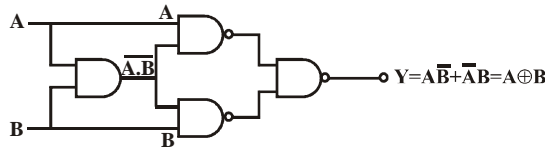
$$L_p^2 = \mu_p \cdot V_T \cdot \tau_p = \frac{500 \text{ cm}^2}{\text{V sec}} \times 26 \times 10^{-3} \text{ V} \times 130 \times 10^{-9} \text{ sec} \quad L_p^2 = 500 \times 26 \times 130 \times 10^{-12} \text{ cm}^2$$

$$L_p^2 = 1690000 \times 10^{-12} \text{ cm}^2 \quad L_p = 1300 \times 10^{-6} \text{ cm}$$

$$L_p = 13 \times 10^{-4} \text{ cm} \quad L_p = 13 \text{ Microns}$$

**Reference:** Refer Panacea Electronics device theory book page number- 16

25. B.



**Reference:** Refer Panacea digital theory book page number- 23

26. B. At surface 1 -ve charge will be accumulated due to magnetic force and to maintain charge neutrality +ve charge will be accumulated at surface-2 .So In case of N-Type S.C. -ve charge will be accumulated at surface 1 & +ve charge at surface 2.

**Reference:** You can refer Panacea Electronics & device theory book page number- 20

27. B. Max<sup>m</sup> power dissipation at 25°C h is 700mW

$$\frac{d\omega}{dT} = -5 \text{ mW/}^\circ \text{C}$$

So Power available at 65°C will be

$$700 - 5 \times 40 = 500 \text{ mW}$$

Now at 65°C

$$500 \text{ mW} = V \times I = 0.7 \times I$$

$$\text{So } I = \frac{500}{0.7} = 714 \text{ mA}$$

**Reference:** Did this type of question in panacea classes. It's just a common sense problem.

28. A. If diode is ideal then drop across diode will be zero.

So Value of current I will be

$$I = \frac{3 - (-3)}{10} = 0.6 \text{ mA} \quad \text{Now } 3 - V = 10 \times I$$

$$3 - V = 10 \times 0.6 \Rightarrow V = 3 - 6 = -3 \text{ V}$$

**Reference:** Did this type of question in panacea classes.

29. D. Spectral response of photo diode is range of optical wavelengths that photodiode can convert to electrical current.

So statement (4) is not correct.

$$I = I_0 (1 - e^{V/V_T}) + I_S$$

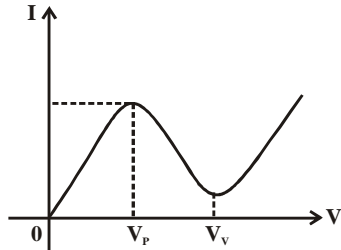
For open circuit voltage  $I = 0$  &  $V = V_{OC}$

So  $0 = I_0 + I_s - I_0 \cdot e^{V_{oc}/V_T}$

$\therefore \frac{V_{oc}}{V_T} = \ln\left(1 + \frac{I_s}{I_0}\right) \therefore V_{oc} = V_T \ln\left(1 + \frac{I_s}{I_0}\right)$

**Reference:** Refer Panacea Electronics device & circuit theory book page number-48&49. You can also refer Page 79-82 in Milliman-Helikas book.

30. B.



**Reference:** You can also refer Page 744-745 in Milliman-Helikas book. We discussed this topic in detail in Class.

31. D Output of stepdown transformer

$$V_{rms} = \frac{240}{8} = 30V, rms$$

$$30V, rms = \frac{V_m}{\sqrt{2}} \Rightarrow V_m = 30\sqrt{2} \text{ volt} = 42.5 \text{ volt}$$

**Reference:** This is very basic questions and can get many similar questions in Panacea assignment.

32. D. **Reference:** Refer Panacea Electronics device & circuit theory book page number-51. You can also refer Page 83&84 in Milliman-Helikas book.

33. C.  $\alpha = 0.99 \quad I_B = 20 \mu A$

$$\beta = \frac{\alpha}{1 - \alpha} = \frac{0.99}{1 - 0.99} = 99$$

$$I_C = \beta I_B = 99 \times 20 = 1980 \mu A = 1.98 mA$$

$$I_E = I_B + I_C = 20 + 1980 \Rightarrow I_E = 2000 \mu A = 2 mA$$

**Reference:** Refer Panacea Electronics device & circuit theory book page number-93.

34. C. In PLA i.e. Programmable Logic Array both AND & OR gate are programmable. ROM is made by decoder and OR gate. PLA is a programmable device used to implement Combinational Logic circuits. It is used for synthesis of So P and POS Canonical forms.

**Reference:** Refer Panacea Digital theory book page number-60.

35. B. Gate recovery time is a part of turn-off time and it is the time in which recombination of charges take place. So statement -4 is incorrect. So only option-B is correct.

**Reference:** Refer Page 71-72 in P.S. Bhimbra book.

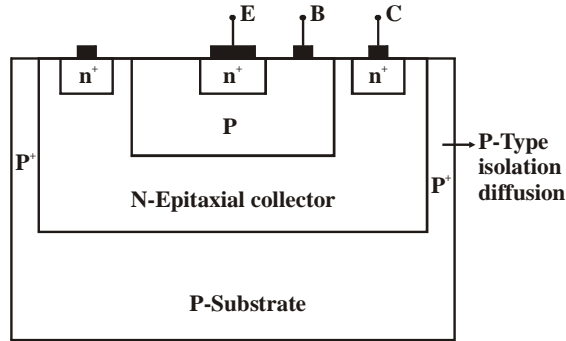
36. B. Once thyristors is ON gate loses control. SCR can be turned doff by reducing the anode current below holding current

**Reference:** Refer Page 70 in P.S. Bhimbra book. Also refer Panacea Electronics device & theory book Page number 71.

37. D **Fabrication of a BJT:**

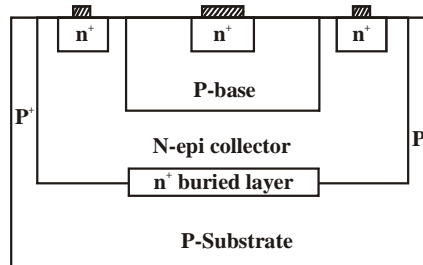
General steps are:

1. wafer preparation
2. Epitaxial growth
3. Oxidation
4. Isolation diffusion
5. Base diffusion
6. Emitter diffusion
7. Aluminum metallization



**Buried layer in BJT:**

The higher collector resistance of an integrated transistor can be easily reduced by a process known as buried layer as shown in figure. In this case a heavily doped n<sup>+</sup> region is sandwiched between the n type epitaxial collector and P type substrate. This buried n<sup>+</sup> region provides a low resistivity current path from active collector region (n<sup>+</sup> type layer) to the collector contact (n<sup>+</sup> contact layer). So n<sup>+</sup> layer shunts the n layer of collector region with respect to flow of current thus effectively reduces value of collector resistance.



**Reference:** Refer Panacea Electronics device & circuit theory book page number-87.

38. C. By use of current mirror biasing scheme fabrication will be done at less space.
39. D CMOS has high input impedance & low output impedance.

**Reference:** It is basic concept of MOS and CMOS

40. D. **Reference:** Refer Electronics Device theory book Page number 48-51.
41. C. **Reference:** Similar type of are available in Panacea theory & assignment book
42. B If  $GCF > PCF$ - Stable system  
 If  $GCF = PCF$ - Marginal stable system  
 If  $GCF < PCF$ - Unstable system

**Reference:** Discussed in Panacea classes.

43. A. By definition of state variable transfer function.  
**Reference:** Refer Panacea control system theory book page number-96

44. A.  $y(n) + y(n - 1) = x(n)$

Taking Z-Transform

$$(1 + Z^{-1})Y(Z) = X(Z) \qquad \frac{Y(Z)}{X(Z)} = \frac{Z}{Z + 1}$$

But  $x[n] = u[n]$

$$X(z) = \frac{1}{1 - Z^{-1}} = \frac{Z}{Z - 1} \qquad \text{So} \qquad Y(z) = \frac{Z}{Z + 1} \cdot \frac{Z}{Z - 1} = \frac{Z^2}{(Z + 1)(Z - 1)}$$

**Reference:** Similar type of problems are available in Panacea theory & assignment book

45. A  $f(t)\delta(t) = f(0)$ . So statement 1 is wrong.

**Properties of delta function:**

1.  $\int_{-\infty}^{\infty} \delta(t) dt = 1$

2.  $x(t) \cdot \delta(t) = x(0)$

3.  $x(t) \cdot \delta(t - t_0) = x(t_0)$

4.  $\delta(at) = \frac{1}{|a|} \delta(t)$

5.  $\int_0^{\infty} \delta(t) dt = \text{Not defined}$

6.  $\int_{-\infty}^{\infty} \delta(t) dt = 1$

7.  $\int_{-\infty}^0 \delta(t) dt = \text{Not defined}$

8.  $\int_{0^-}^{0^+} \delta(t) dt = 1$

9. If  $x(t)$  is continuous at  $t = 0$ . Then  $x(t)\delta(t - t_0) = x(t_0)\delta(t - t_0)$

10. If  $x(t)$  is continuous at  $t = t_0$  then any continuous-time signal  $x(t)$  can be expressed as

$$x(t) = \int_{-\infty}^{\infty} x(\tau)\delta(t - \tau) d\tau$$

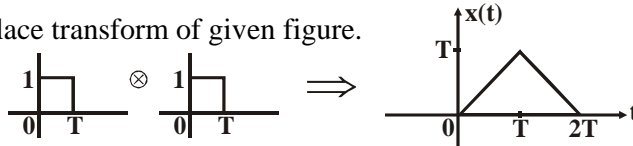
**Reference:** Refer Panacea signal system theory book page number-10

46. D. **Reference:** Refer Panacea Control theory book Page number-74

47. D. **Reference:** Similar type of are available in Panacea theory & assignment book

48. A. **TRICKS:**

Calculate Laplace transform of given figure.



$$u(t) - u(t - T) \quad \frac{1}{S} - \frac{e^{-ST}}{S} = \frac{1 - e^{-TS}}{S} \quad \therefore \left( \frac{1 - e^{-ST}}{S} \right)^2$$

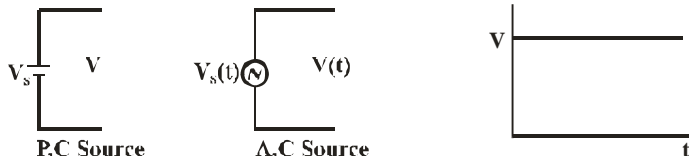
Triangular pulse is convolution of two rectangular pulse of same duration.

**Reference:** Refer same trick in Panacea signal system theory book page number-78.

49. A.  $\tau = \frac{L}{R}$  &  $RC$  Very basic question.

50. C. **Active Elements**

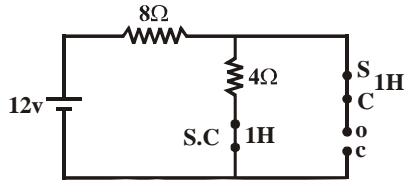
**1. Voltage Source:** Ideal voltage source delivers energy at specified voltage V



Internal resistance of the ideal voltage source is zero.

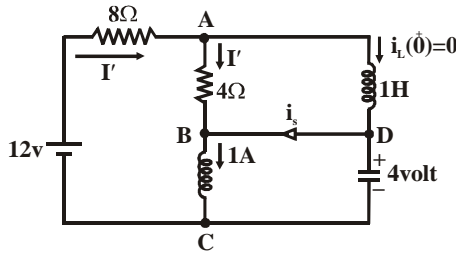
**Reference:** Refer Panacea Network theory book Page number -8 topic is active element.

51. A. Before closing the Switch:



Current in  $4\Omega$  resistor will be  $I = \frac{12}{12} = 1A$  & voltage across cap = 4V. Because No Current will flow

in II branch. After closing the switch Inductor current will remain constant at  $t = 0^+$ .



$V_{BC} = 4 \text{ volt at } t = 0^+$

$$12 = 8I' + 4I' + 4 \Rightarrow I' = \frac{2}{3} A \text{ at } t = 0^+$$

Apply KCL at Node B

$$\frac{2}{3} + I_s = 1 \quad \therefore I_s = \frac{1}{3} \text{ Amp.}$$

**Reference:** Many similar type of problems are available in Panacea theory & assignment book.

52. D. Basic properties of Inductor & Capacitor. Inductor needs high value of voltage if there is instantaneous change in current and capacitor needs high value of current if there is instantaneous change in voltage.

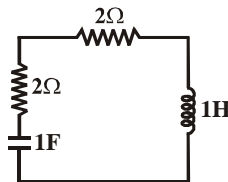
**Reference:** Discussed this concept in detail in Panacea class.

53. D These are basic concepts of theorems

**Reference:** Just go through outline of all network theorems from Panacea Network theory book

54. C. By Use of KCL

55. C When Switch is opened at  $t = 0$

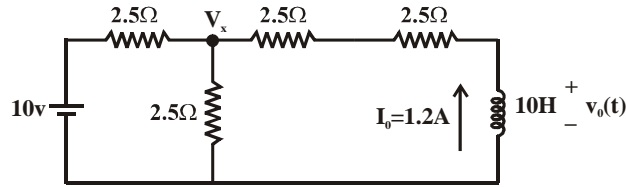


$$R = 4\Omega \quad L = +1H \quad C = 1F$$

$$\xi = \frac{R}{2} \sqrt{\frac{C}{L}} = 2 \quad \text{So it is overdamped}$$

**Reference:** Refer Panacea Network theory book page number-63 for formulas and concepts

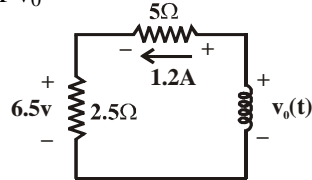
56. A. At  $t = 0$ , switch is closed.



Nodal at  $V_x$  :

$$\frac{10 - V_x}{2.5} + 1.2 = \frac{V_x}{2.5} \quad \therefore \quad 10 - V_x + 3 = V_x \Rightarrow V_x = 6.5 \text{ volt}$$

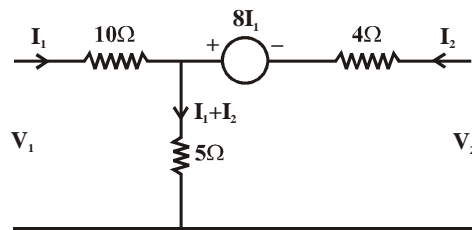
For calculation of  $v_0$



$$6.5 + 5 \times 1.2 - v_0(t) = 0 \quad \therefore \quad v_0(t) = 12.5 \text{ volt}$$

**Reference:** Many similar type of problems are available in Panacea theory & assignment book

57. A.



$$V_1 = 10I_1 + 5(I_1 + I_2) \rightarrow (1)$$

$$V_2 = 4I_2 - 8I_1 + 5(I_1 + I_2) \rightarrow (2)$$

$$V_1 = 15I_1 + 5I_2 \quad Z_{11} = 15 \quad Z_{12} = 5$$

$$V_2 = -3I_1 + 9I_2 \quad Z_{21} = -3 \quad Z_{22} = 9$$

$$[Z] = \begin{bmatrix} 15 & 5 \\ -3 & 9 \end{bmatrix} \quad \Delta Z = 135 - (-15) = 150$$

$$Y_{11} = \frac{Z_{22}}{\Delta Z} = \frac{9}{150} = \frac{3}{50} \quad Y_{12} = \frac{-Z_{12}}{\Delta Z} = \frac{-5}{150} = \frac{-1}{30}$$

**Reference:** Refer Panacea Network theory book page number-54 for formulas.

58. C.

$$2I_1 + 4I_2 = V_1 \quad 8I_1 + 16I_2 = V_2$$

$$\text{So } Z_{11} = 2, \quad Z_{12} = 4$$

$$Z_{21} = 8, \quad Z_{22} = 16$$

**Reference:** Many similar type of problems are available in Panacea theory & assignment book

59. B.

$$V_1 = 10^3 I_1 + 10 I_2 \rightarrow (1)$$

$$V_2 = -10^6 I_1 + 10^4 I_2 \rightarrow (2)$$

$$\text{Here } V_2 = -10^4 I_2 \rightarrow (3)$$

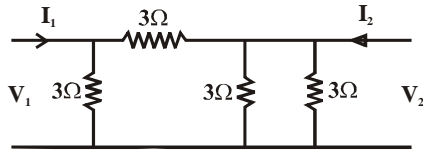
By (2) & (3)

$$-10^4 I_2 = -10^6 I_1 + 10^4 I_2$$

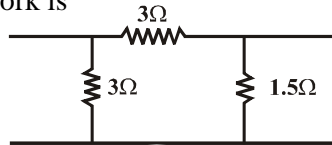
$$\therefore 2 \times 10^4 I_2 = 10^6 I_1 \quad \text{So } \boxed{I_2 / I_1 = 50}$$

**Reference:** Many similar type of problems are available in Panacea theory& assignment book

60. A. Transform Star–Network into Delta



Equivalent network is



$$Y_{12} = -(1/3) \text{ Mho}$$

**Reference:** Many similar type of problems are available in Panacea theory& assignment book.

61. None

Only statement 3 is correct.

**Conditions for valid transfer function:**

Let any function is  $H(s) = \frac{P(s)}{Q(s)}$  then conditions for driving point impedance are:

1. Coefficients of P(s) must be real only (These may be negative also) .But in case of Q(s) coefficients must be positive and real only.
2. The poles and zeros are complex then they must be conjugate to each other.
3. Real parts of all poles and zeros not be positive and if real part is zero then it means poles and zeros must be simple.
4. Polynomial P(s) may have any missing terms.
5. Polynomial Q(s) may have any missing terms between higher & lower degree until unless all even and odd terms are missing.
6. Degree of P(s) must be independent of degree of Q(s)

**Reference:** Refer Panacea Network theory book page number-88.

62. B. Very simple problem

**Reference:** Similar type of are available in Panacea theory& assignment book

63. B. For RL driving pt. impedance only 2 is correct, but synthesis of both impedance & admittance can be done by 2 & 3.

**Conditions for RL driving point impedance or RC driving point admittance:**

1. Poles and zeros must lie on real negative real axis of S-plane.
2. Slope of impedance curve is positive at all points.
3. Poles and zeros are interlaced to each other
4. First critical frequency is zero and last critical frequency is pole.
5. Impedance at  $s = \infty$  is always greater than at  $s = 0$

**Reference:** Refer Panacea Network theory book page number-88.

64. B 
$$Z(s) = \frac{3(s^2 + 1)(s^2 + 49)}{(s^3 + 9s)}$$

$$= s^3 + 9s \sqrt{\frac{3s^4 + 150s^2 + 147}{3s^4 + 27s^2}} \cdot 3s$$

So  $z(s) = 3s + \frac{123s^2 + 147}{s^3 + 9s}$

$$z(s) = 3s + \frac{3(41s^2 + 49)}{s(s^2 + 9)} \qquad z(s) = 3s + \frac{49}{3s} + \frac{320}{3(s^2 + 9)}$$

$$L_0 = 3H \qquad C_0 = \frac{3}{49}$$

**Reference:** Refer Panacea Network theory book page number-94.

65. D. **Reference:** Refer Panacea Network theory book page number-88.

66. A. Just by definition of Mutual Inductance

67. C. **Faraday's Law:**

The emf produced by a changing field within a stationary circuit is called transformer emf.

So  $V = -\frac{d\phi}{dt}$  is transformer induction equation. The Faraday's law in integral form is written as

$$V_e = \oint E \cdot dl = \int_s \frac{\partial B}{\partial t} \cdot ds \qquad V = -\frac{d\phi}{dt} \qquad \phi = \frac{1}{3} \lambda t^3 \qquad \therefore \frac{d\phi}{dt} = \lambda t^2$$

Now  $9 = -\lambda \times (3)^2 \Rightarrow \lambda = -9$

**Reference:** Refer Panacea EMT book page number-29

68. D.  $E = -\nabla V \qquad \nabla V = \frac{\partial V}{\partial x} \mathbf{1}_x + \frac{\partial V}{\partial y} \mathbf{1}_y + \frac{\partial V}{\partial z}$

$V = 4x + 2 \qquad E = \frac{-dv}{dx} = -4\mathbf{a}_x \text{ V/m}$

**Reference:** Refer Panacea EMT book page number -18

69. A.  $I = 4 \times 10^{-4} \mathbf{a}_y \text{ Amp} \qquad H = \frac{5}{\mu} \mathbf{a}_x$

$B = \mu H \qquad \therefore \vec{B} = 5\mathbf{a}_x \qquad \vec{F} = I(\vec{dl} \times \vec{B})$   
 $= 4 \times 10^{-4} (\mathbf{a}_y \times 5\mathbf{a}_x) \qquad = -2\mathbf{a}_z \text{ mN}$

**Reference:** Similar type of are available in Panacea theory & assignment book

70. C. **Analogy of Electric and Magnetic field:**

| Electric field   | Magnetic field |
|------------------|----------------|
| Conductivity     | Permeability   |
| Electric current | Magnetic flux  |
| EMF              | MMF            |
| Resistance       | Reluctance     |
| E                | H              |
| Conductance      | Permeance      |

**Reference:** Discussed this analogy in Panacea classes

71. C. Change density (C.D) =  $\nabla \cdot D$

$$\nabla \cdot \mathbf{J} = \frac{1}{r} \frac{\partial}{\partial r} (r J_r) + \frac{1}{r} \frac{\partial J_\phi}{\partial \phi} + \frac{\partial J_z}{\partial z} \quad - (2) \quad \text{Cylindrical}$$

$$C.D. = \frac{\partial}{\partial z} (z \zeta \cos^2 \phi) = \zeta \cos^2 \phi = \zeta = 1, \phi = \frac{\pi}{4} \quad z = 3$$

$$C.D = 1. (\cos \pi/4)^2 = 0.5$$

**Reference:** Refer panacea EMT book page number-8

72. B.  $\frac{\tan \alpha_1}{\tan \alpha_2} = \frac{3}{\sqrt{3}} \quad \alpha_1 = 60^\circ$

$\therefore \frac{\tan 60^\circ}{\tan \alpha_2} = \sqrt{3} \quad \tan \alpha_2 = 1 \quad \Rightarrow \boxed{\alpha_2 = 45^\circ}$

**Reference:** Refer Panacea EMT book Page number-33.

73. B. Brewster angle:

$$\boxed{\tan \theta_i = \sqrt{\frac{\epsilon_2}{\epsilon_1}}}$$

This angle is called Brewster angle, there is no reflected wave when the wave is parallel (or vertically) polarized. If the incident wave is not entirely parallel polarized, there will be some reflection, but the reflected wave will be entirely of perpendicular (or horizontal) polarization.

$$\tan \theta_i = \sqrt{\frac{\epsilon_2}{\epsilon_1}} = \sqrt{\frac{9}{4}} = \frac{3}{2} \quad \theta_i = \tan^{-1}(3/2)$$

**Reference:** Refer panacea EMT book page number-62

74. B. Just use Right hand Rule for calculating direction.

75. B.  $\vec{E} = 10 \cos(10^7 t + kz) \vec{a}_y \text{ (V/m)}$

wave propagates in  $-\vec{a}_z$  direction.

$$\omega = 10^7 \text{ Rad / sec} = 2\pi.f \quad f = \frac{10^7}{2\pi}$$

$$v = 3 \times 10^8 = \frac{10^7}{2\pi} \times \lambda \quad \lambda = 6\pi \times 10 = 188.5 \text{ meter}$$

**Reference:** Similar type of are available in Panacea theory & assignment book

76. C. When a wave travels from one medium to other medium then freq<sup>n</sup> remains fixed.

$$v \propto \frac{1}{\sqrt{\mu\epsilon}}$$

velocity will become half.

$$v = f.\lambda$$

So  $\lambda$  will become half.

**Reference:** It is basic concept of optics and we are studying this from class 12<sup>th</sup> standard.

77. B.  $\tan \theta_i = \sqrt{\frac{81}{1}} = 9 \quad \theta_i = \tan^{-1}(9) = 83.659 \quad \theta_i = 83.66$

**Reference:** Refer panacea EMT book page number-62

78. D.  $\lambda$  for 63 MHz  $\rightarrow \lambda = 4.76 \text{ met}$

$$\beta = \frac{6.28}{4.76} = 1.32 \text{ Rad/met} \quad \lambda \text{ for 803 MHz} \rightarrow \lambda = 0.373 \text{ met}$$

$$\beta = \frac{6.28}{0.373} = 16.81 \text{ Rad/met}$$

**Reference:** Similar type of are available in Panacea theory& assignment book. It is a basic problem

79. B. VSWR on abbreviation for voltage standing wave Ratio is the ratio of  $E_{\max}$  to  $E_{\min}$ .

It is a measure of the mismatch at the discontinuity. Higher is the value of VSWR indicator greater mismatching between load and line.

$$VSWR = \frac{V_{\max}}{V_{\min}} = \frac{4}{2} = 2$$

**Reference:** Refer panacea EMT book page number-68

80. A. **VSWR for purely resistive load:**

$$VSWR = \frac{R_L}{R_0} \quad \text{If } R_L > R_0 \qquad VSWR = \frac{R_0}{R_L} \quad \text{If } R_0 > R_L$$

$R_0 \rightarrow$  Characteristic impedance of line

$R_L \rightarrow$  Load

$$SWR = \frac{Z_L}{Z_0} \Rightarrow 4 = \frac{Z_L}{60} \therefore Z_L = 240\Omega$$

**Reference:** Refer panacea EMT book page number-69

81. D. **Loading in transmission line:**

To maintain distortion less condition value of Inductors are increased, and which is called as loading in transmission line.

**Reference:** Refer Panacea EMT book page-66

82. D. **Important points about smith chart:**

1. A complete revolution about smith chart represents a distance of  $\lambda/2$  odd lines.
2. Clock wise movement of chart is regarded as moving towards generator or away from load.
3. Since  $\lambda/2$  distance or line corresponds to a movement of  $360^\circ$  on chart, while a  $\lambda$  distance corresponds to  $720^\circ$  movement on chart.
4. Smith chart can be used as both impedance and admittance chart.
5. The circle on smith chart represents normalized constant or conductance while the arcs of circles on smith chart represent normalized reactances or susceptances.

**Reference:** Refer EMT book page-70.

83. A. Transmission line does not store energy.

$$84. A \quad R_r = 80\pi^2 (d\ell/\lambda)^2 \qquad \lambda = \frac{3 \times 10^8}{3 \times 10^6} = 100 \text{ met}$$

$$R_r = 80\pi^2 \times \left(\frac{5}{100}\right)^2 \qquad = \frac{80\pi^2}{400} = \frac{800}{400} = 2\Omega$$

**Reference:** Refer Panacea EMT book page-80.

85. B. **Reference:** Radiation pattern was discussed in Panacea class.

86. D It is a hemi sphere so volume will be  $2\pi r^2$

$$P_T = P_{av} \times 2\pi r^2 \qquad 200 \times 10^3 = P_{av} \times 2\pi (50 \times 10^3)^2$$

$$P_{av} = \frac{2 \times 10^5}{2\pi \times 2500} \times 10^{-6} \text{ W/m}^2 \qquad = \frac{2 \times 10^5}{5\pi \times 10^3} \times 10^{-6} \text{ W/m}^2 \qquad = \frac{40}{\pi} \mu\text{W/m}^2$$

**Reference:** Similar type of problems are available in Panacea assignment book.

87. B. **Reference:** similar problems are available in Panacea E&I theory book and assignment book

88. D. **Reference:** similar problems are available in Panacea E&I theory book and assignment book  
 89. C. **Reference:** similar problems are available in Panacea E&I theory book and assignment book.  
 90. D. **Reference:** Refer panacea E&I theory book.  
 91. D. It uses Op-AMP and these are the basic properties of OP-AMP  
 92. A.  $2cm \rightarrow 220V$        $1cm \rightarrow 110V$        $3cm \rightarrow 330V$   
 93. D. Zero phase shift. So it will be straight line

**Reference:** Refer panacea E&I theory book page-90

94. A. Dual slope ADC is a slow ADC

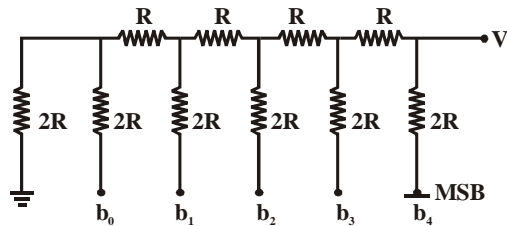
**Imp. Features of dual slope ADC:**

1. Excellent noise rejection capability
2. Analog voltage  $V_a$  is proportional to  $N$  independent of  $R$ ,  $C$  and  $T$ .
3. Long conversion time
4. Very – 2 high accuracy.

**Reference:** Refer panacea digital theory book page-67.

95. D. **Reference:** Refer panacea E&I theory book .

96. A. **(R – 2R) Ladder DAC:**



Analog output voltage

$$V_A = \frac{V_R}{2^n} (b_{n-1} \cdot 2^{n-1} + b_{n-2} \cdot 2^{n-2} + \dots + b_0 \cdot 2^0)$$

$V_R \rightarrow$  Reference voltage

$n \rightarrow$  No. of bits

The no. of resistors required is  $2N$  in case of  $R - 2R$  ladder network. where  $N$  is no. of bits. Value of resistors required is  $N$  in case of weighted resistor DAC.

**Reference:** Refer panacea Digital theory book page number-63

97. C. Max<sup>m</sup> peak ripple voltage

$$= \frac{5}{2^{10}} = \frac{5}{1000} = 5mV$$

**Reference:** Same problem is available in panacea digital assignment book.

98. C. **Reference:** Just read outlines of all transducer in Panacea theory book of Instrumentation.

99. A.      100. C

101. C. **Reference:** Refer Panacea E&I book.

102. B.

103. C       $\frac{40}{47} + \frac{20}{4.7} = \frac{0 - V_0}{470} \Rightarrow V_0 = -2.4 \text{ volt}$

**Reference:** Refer Panacea Analog theory assignment book.

104. B. **Reference:** Refer Panacea EDC theory book page-5

105. B       $W_{rad} = I_{rms}^2 \cdot R_r$

$$R_r \alpha (\ell / \lambda)^2 \quad \ell / \lambda \text{ for case 1 is } 1.5/3 \quad \ell / \lambda \text{ for case 2 is } 15/30$$

So Value of  $\ell/\lambda$  is same for both case

**Reference:** Refer Panacea EMT theory book page-80.

106. D. Base resistance can't improve stability .It will decrease the stability

$$I_C = \beta I_B = \frac{\beta(V_{CC} - V_{BE})}{R_B + (\beta + 1)R_e} \text{ For emitter stabilised bias}$$

If  $R_B$  is increased then  $I_C$  will become more dependent upon beta.

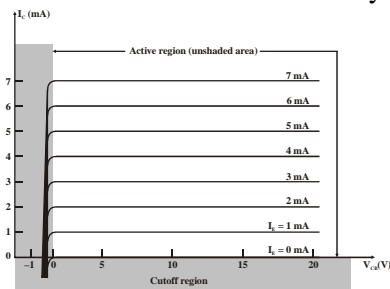
**Reference:** Refer Panacea EDC theory book page-108.

107. D. Thermal run away does not occur in case of FET.

108. A. It is interesting that the elements which at room temperature are good conductors (Cu, Ag, Au and the alkali metals) are absent from the list of superconducting elements. In fact the superconducting elements are relatively poor conductors at room temperature.

**Reference:** Refer Panacea Material theory book page-46

109. B



**Reference:** Refer Panacea EDC theory book page-96

110. B. **Reference:** Refer Panacea EDC theory book page-108.

111. B. 112. A.

113. C. Doping is light and width of base region is light and not conductivity.

**Reference:** Refer Panacea EDC theory book page-93.

114. A. **Reference:** Refer Panacea EDC theory book page-88.

115. B. **Power factor:**

The term  $\cos\phi$  in average power is called power factor. It is cosine of angle between voltage & current in any circuit. Power factor is unity in resistive circuit.

$$\cos\phi = \frac{R}{Z} = \frac{P}{S} = \frac{VI \cos\phi}{VI} = \frac{\text{watt}}{\text{VA}}$$

Power factor  $\cos\phi$  is ratio of average power to instantaneous power

**Reference:** Refer Panacea Network theory book page-27.

116. A. **Reference:** Refer Panacea Network theory book page-62.

117. A. **Reference:** Refer Panacea EMT theory book page-17.

118. C. **Reference:** Refer Panacea EMT theory book page-29.

119. B. **Reference:** Refer Panacea EMT theory book page-32&33.

120. A

**IES-2011 detailed solution Paper – II (Set-A)**

1. B
2. A. Astable multivibrator does not variable pulse width.
3. A. If By pass capacitor is disconnected then negative feedback will come into picture and gain will be reduced but to maintain GBWP .Bandwidth will be increased.

**Reference:** Panacea EDC theory book

4. B 
$$I = \frac{10}{47}$$

At resource  $Z = R = 47 = 0.212 K$

5. D. 6. D. **Reference:** Refer PLL

7. D. **Reference:** See advantages of active filter in analog theory book.

8. C 9. B 
$$f = \overline{(x \cdot \bar{y} + \bar{x} \cdot y)} = x \oplus y \quad f = x \ominus y$$

10. B 
$$f = \bar{P}Q + QR + PR$$

|   |  |    |    |    |    |
|---|--|----|----|----|----|
|   |  | QR |    |    |    |
| P |  | 00 | 01 | 11 | 10 |
| 0 |  |    |    | 1  | 1  |
| 1 |  |    | 1  | 1  |    |

$$f = PR + \bar{P}Q$$

11. C 12. D 13. A. 14. B. 15. A 16. D

17. B 
$$f = \omega + \bar{\omega}x + \bar{x}yz$$

By solving K – Map 
$$f = \omega + \bar{x}yz$$

So There is no need of Gate – 2

**Reference:** Refer Panacea digital theory book logic family

18. D. **Reference:** It is already available in panacea assignment of digital

19. D 20. A. **Reference:** Refer Panacea digital theory book for conversion of FFs

21. C 4-bit Ripple counter will have propagation delay of  $4 \Delta t$ , where  $\Delta t$  is propagation delay of one flip-flop. So  $T = 4 \times 12 = 48 \text{ n sec}$

**Reference:** Basic problem of counter

22. C. Present state is 0111 1111 and its value is 127. After 135 clock pulses its value in decimal value will be  $127 + 135 = 262$ . Total No. of clock pulses will be 262.

After 256 clock pulses value will become  $262 - 256 = 6$ .

So Present value will be 0000 0110.

**Reference:** Basic problem of design of counter

23. B. **Reference:** Many similar problems are available in Panacea digital assignment book.

24. A. Miller sweep is a current time base generator circuit which is used for improving linearity of circuit.

**Reference:** Discussed Miller&Bootstrap circuit in Panacea class in detail

25. A. Dual slope integration type ADC has very good accuracy and there is good rejection of power supply hum.

**Imp. Features of dual slope ADC:**

1. Excellent noise rejection capability
2. Analog voltage  $V_a$  is proportional to  $N^{-7}$  independent of R, C and T.
3. Long conversion time
4. Very – 2 high accuracy.

**Reference:** Refer Panacea digital theory book page-67

$$26. B. \quad \frac{C(s)}{R(s)} = \frac{10/s+1}{1+\frac{10}{s(s+1)}} = \frac{10s}{(s^2+s+10)}$$

$$\text{if } r(t) = u(t) \text{ then } R(s) = 1/s \quad \therefore \quad C(s) = \frac{10}{(s^2+s+10)}$$

Steady state value of output  $c(t)$  is

$$\lim_{x \rightarrow \infty} C(t) = \lim_{s \rightarrow 0} s.C(s) = \lim_{s \rightarrow 0} \frac{10s}{(s^2+s+10)} = 0$$

**Reference:** Many similar problems are available in Panacea control assignment book

$$27. B \quad \frac{C(s)}{R(s)} = \frac{1}{s(s+1)}$$

if  $r(t) = \delta(t)$  then  $R(s) = 1$

$$C(s) = \frac{1}{s(s+1)} = \frac{1}{s} - \frac{1}{s+1} \quad C(t) = (1 - e^{-t})$$

**Reference:** Many similar problems are available in Panacea control assignment book

$$28. B. \quad G(s) = (s+1)$$

$$\text{Gain } |G(s)| = \sqrt{1+\omega^2} \quad \text{Phase } \phi = \tan^{-1} \omega$$

$$\text{Gain at } \omega = 1, |G(s)| = \sqrt{2} \text{ \& } \phi = \tan^{-1} 1 = 45^\circ$$

$$29. B. \quad G(s)H(s) = \frac{1}{s(s^2+2s+2)}$$

Type of system = 1

**Reference:** Refer type and order of system in Panacea control theory book page-41.

$$30. B. \quad 40 \frac{dx}{dt} + 2x = f(s) \quad X(s)(40s+2) = F(s) \quad \frac{X(s)}{F(s)} = \frac{1}{40s+2}$$

$$\text{Pole will be at } s = -\left(\frac{1}{20}\right)$$

Time const. is reciprocal of location of pole for a 1<sup>st</sup> order system.

**Reference:** Refer Panacea control theory book page-4.

$$31. B. \quad t_s(5\%) = \frac{3}{\xi\omega_n} = 0.6 \quad \therefore \quad \xi\omega_n = 5 \quad \xi = \frac{1}{\sqrt{2}}$$

Second order system has characteristic equation  $s^2 + 2\xi\omega_n s + \omega_n^2 = 0$

$$\boxed{s = -\xi\omega_n \pm j\omega_d} \quad \omega_d = \omega_n \sqrt{1-\xi^2} = 5\sqrt{2} \sqrt{1-\frac{1}{2}} = 5$$

So poles will be located at

$$s = -5 \pm j5$$

**Reference:** Refer Panacea control theory book page-43.

|        |       |                     |     |     |
|--------|-------|---------------------|-----|-----|
| 32. D. | $S^4$ | 1                   | 24  | $K$ |
|        | $S^3$ | 8                   | 32  |     |
|        | $S^2$ | 20                  | $K$ |     |
|        | $S^1$ | $\frac{640-8K}{20}$ | 0   |     |
|        | $S^0$ | $K$                 |     |     |

If  $K = 100$  then  $\frac{640-8K}{20} = -8$ , So there is sign change & system becomes un stable.

**Reference:** Basic problem of RH criterion

33. B.  $K = 0$ , Open Loop poles will be at poles

$K = \infty$ , open loop poles will be at zeros

**Reference:** Refer Panacea control theory book page-63.

34. C. 
$$C \equiv \frac{\Sigma P - \Sigma Z}{P - Z}$$

$$C \equiv \frac{(0-4-2)-(-1)}{4-1} = -\left(\frac{5}{3}\right)$$

35. B.

**Reference:** Refer Panacea control theory book page-63

36. B. Charact. Eq<sup>n</sup> is  $1 + GH = 0$

$$s^2 + 4s + 3 + 4K = 0$$

$$2\xi\omega_n = 4 \quad \Rightarrow \quad \omega_n = 2\sqrt{2}$$

$$\omega_n^2 = 3 + 4K = 8$$

$$\therefore 4K = 5$$

$$\Rightarrow K = 5/4$$

37. D.  $N = P$ , if  $P > Z$   
 $= Z$ , if  $P < Z$

**Reference:** Refer Panacea control theory book page-63

38. C. 
$$H(s) = \frac{10(s+1)}{(s+2)}$$
 (RL impedance circuit)

If sinusoidal input  $\sin t$  is given then O/P  $y(t)$  will be : ( $\omega = 1$  for I/P)

$$y(t) = \frac{10\sqrt{2}}{\sqrt{3}} \cdot \sin(\omega t + \phi)$$

Where  $\phi = \tan^{-1}(1) - \tan^{-1}(1/2)$  So O/P will lead the current.

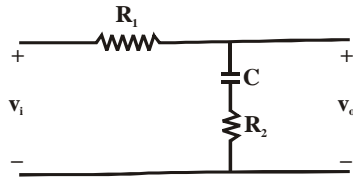
39. D.

40. C. GM is -ve dB then system will be stable

**Reference:** Basic definition

41. B. 42. B

43. A. Phase lag compensator.



$$\frac{V_o(s)}{V_i(s)} = \frac{1+bTS}{1+TS} \quad \text{where } b = \frac{R_2}{R_1+R_2}$$

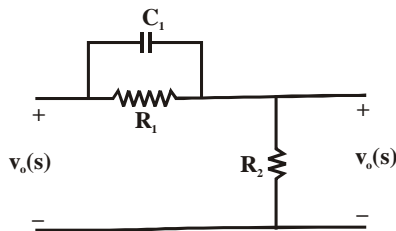
$$bT = R_2C$$

Here  $b < 1$ , So working like a phase lag network.

But when  $b$  is replaced by  $\alpha$  where  $\alpha > 1$  then

$$\frac{V_o(s)}{V_i(s)} = \frac{(1+TS)}{(1+\alpha TS)}$$

44. A. Phase lead compensator:



$$\frac{V_o(s)}{V_i(s)} = \frac{(1+aTS)}{a(1+TS)}$$

here  $a = \left(1 + \frac{R_1}{R_2}\right)$  &  $T = \frac{R_1 C_1}{R_1 + R_2}$

here  $a > 1$  and it is in  $N^r$  So can provide phase lead.

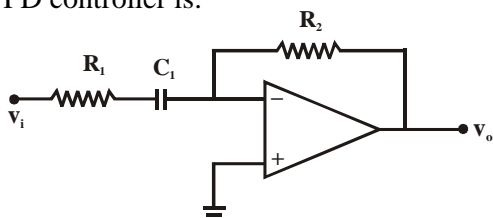
If  $a$  is replaced by  $\beta$  where ( $\beta < 1$ ) then  $\beta$  must come in  $D^r$  and desired answer will be:

$$\frac{V_o(s)}{V_i(s)} = \frac{\beta(1+TS)}{(1+\beta TS)}$$

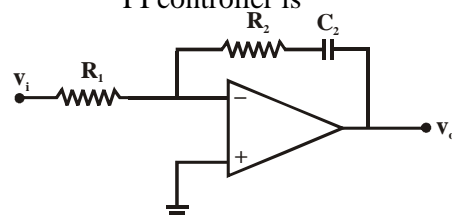
**Reference:** Discussed all above circuits in Panacea class.

45. C 46. D

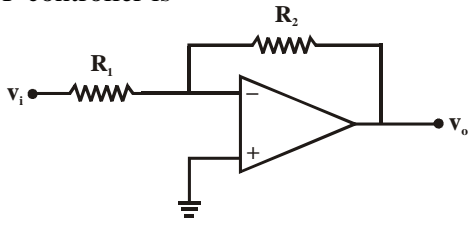
PD controller is:



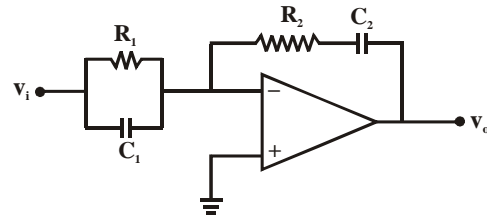
PI controller is



P controller is



PID controller is



**Reference:** Discussed all these circuits in Panacea class.

47. B. Entropy for  $S_1$  is  $H_1 = \log_2^4 = 2$   
 Entropy for  $S_2$  is  $H_2 = \log_2^{16} = 4$

**Reference:** Refer Panacea communication theory book page-66

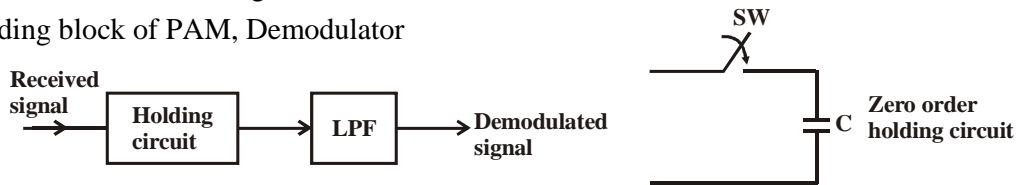
48. B.  $B.W = 2(\Delta f + f_m)$   
 $f_m$  is the Max<sup>m</sup> freq<sup>n</sup> and is equal to 5 KHz  
 $B.W = 2(3 + 5) = 16$  KHz

**Reference:** Refer Panacea communication theory book page-26

49. D. 50. B Pilot carrier is used for synchronization in SSB Modulation

**Reference:** Basic building blocks

51. A. Building block of PAM, Demodulator



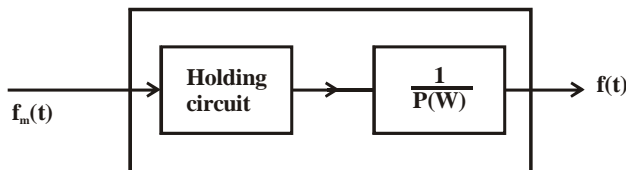
**Reference:** Page 446 Singh & Sapre.

52. B. ON – OFF Keying is type of ASK, which is a digital modulation technique.

**Reference:** Refer Panacea communication theory book page-51.

53. B. Both Hamming & convolution codes are error correcting codes

54. D. In Flap top pulses there is need of equalizer to avoid distortion.



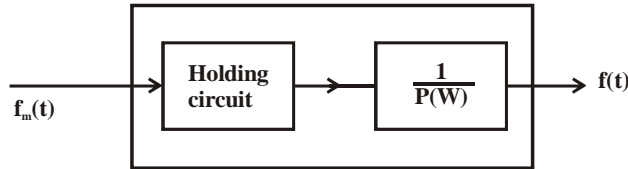
**Reference:** Refer Panacea communication theory book page-38& also refer Singh&Sapre book page-444

55. D. **Reference:** Refer panacea optical fiber material

56. B. PMD is another form of dispersion that affects high speed signals in longer range systems.

It is a minor type of dispersion that becomes significant in a system that has already minimized other forms of dispersion and is operating at Gigabit data rate. PMD arises from the fact that even a single mode can have two polarization states. A typical PMD value is 0.5 psec/km. It is significant in case of single mode fiber. **Reference:** Page –70, Donald J. Stenling

57. B Equalizer has Transfer function complementary to original response.



**Reference:** Refer Panacea communication theory book page-38& also refer Singh&Sapre book page-444

58. A. Radio Horizon =  $\frac{4}{3} \times$  optical Horizon

**Reference:** Refer Panacea EMT theory book page-89

59. C. in Ducting radio signals are guided or ducted which tend to follow curvature of earth. It experiences less attenuation in ducting. This is also known as super refraction .

**Reference:** Refer Panacea EMT theory book page-89

60. A. In freq<sup>n</sup> diversity same antenna is used for the receivers, which work with simultaneous transmissions at 2 or more frequencies. But disadvantage is that it requires a large freq<sup>n</sup> range to work with more frequencies. So here frequency spectrum is wasted without power utilization. Hence freq<sup>n</sup> diversity is preferred only under circumstances where space diversity can't be employed. If it is difficult to separate the receivers with sufficient distance of separation, then in such restricted space the freq<sup>n</sup> diversity is employed. The freq<sup>n</sup> diversity at high freq<sup>n</sup> is of practical importance in ship to shore communication and ship to ship communication.

**Reference:** Refer Topic 7.14 book K. A. Bakshi A.P Godse

61.A Three radio freq<sup>n</sup> are used in earth for point to point communication.

1. Long wave Radio
2. Short wave Radio
3. Microwave Radio

Out of these three, Microwave radio is used. Microwave radio is used for deep space communications.

A microwave beam travels in a straight line. It can be reflected from a smooth surface and it can be focused by a lens or a curved reflector to increase its strength, or brightness. As microwave frequencies increase, more signal from a spacecraft hits the antenna reflector on Earth because the transmitted radio beam is narrower. It has a tighter focus when pointed at Earth. The result is a stronger signal received and a weaker noise level.

**Reference:** Online material.

62. B  $MUF = f_c \text{ seci}$

So  $MUF > f_c$

Angle of incidence will be governed by height of ionospheric layer.

**Reference:** Refer EMT theory book-88

63. B. Receiving power will be decreased due to mismatching in polaristaion.

64. D. Main advantages of Microwave are

1. No need of cable
2. Wide Band width

3. Multiple channels available

**Reference:** Refer Panacea microwave theory book

65. B. Advantages of a geostationary orbits include:

- (1) Large spatial coverage (five geostationary satellites are enough to cover all of the non-polar regions of the Earth).
- (2) permanent visibility of the satellite allowing continuous telecommunications and high rate of repetition for observations (near continuous time sampling - 30 min and 15 min for Meteosat, a few minutes for GOES).
- (3) One ground segment is enough for the satellite monitoring
- (4) Make repeated observations over a given area (constant view area)

**Reference:** Online material

66. A. Low Earth orbit will be at smaller distance and hence path loss will be less.

67. A. Satellite orbit period is

$$T = \sqrt{\frac{4\pi^2 r^3}{GM}} \quad \text{G is universal gravitational constant}$$

**Reference:** Refer Panacea satellite theory book –Kepler’s law

68. A. Due to Avalanche effect they have noise problem

**Limitation of IMPATT:**

The noise is the biggest problem with these diodes. The noisy performance arises from the avalanche process where the high operating current generates shot noise. When used as amplifiers they produce noise figures of the order of 30dB. IMPATT oscillators are not as good as klystrons or Gunn diodes. IMPATT diodes are more efficient and more powerful than Gunn diode but due to noise problem they are not able to replace Gunn diodes. So IMPATT diodes are known as narrow band device while Gunn diodes are broadband devices.

**Reference:** Refer IMPATT in Panacea Microwave theory book page-29

69. D. Gunn diode is Junction less diode

**Reference:** Refer Gunn diode in Panacea Microwave theory book page-24

70. D. Refer different modes in Gunn diode in panacea book on page-27&28.

71. D. Bunching occurs in all three cases.

**Reference:** Refer Panacea Microwave theory book

72. B. Gunn-diode is an oscillator Tunnel diode is used for oscillator as both are -ve resistance devices.

**Reference:** Refer Panacea Microwave theory book

73. A. IMPATT is used for low power not for very low power. While Gunn diode is used for very low power of the order of milliwatt.

**Reference:** Refer Tunnel diode in Panacea Microwave theory book page-24

74. A. Basic problem

75. D. Basic question of Magic-T

76. C. Characteristic Impedance for a wide Microstrip line was derived by Assadaurian is expressed as

$$Z_0 = \frac{377}{\sqrt{\epsilon_r}} \cdot \frac{h}{\omega} = \frac{377}{\sqrt{9}} \times \frac{0.5}{3} = \frac{188.5}{9} = 20.9 \approx 21\Omega$$

**Reference:** Refer Page-476 in Y.LIAO Book of microwave.

77. A. It is Quasi TEM and pure TEM. **Reference:** Panacea Microwave theory book page-32

78. D. Maxwell equation is valid everywhere.

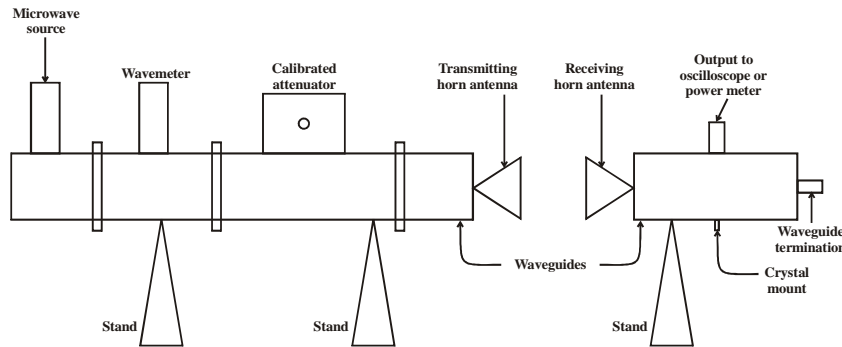
79. D. Isotropic antenna is used for calculation of directive gain

Directive gain is the ratio of radiated power in a given direction relative to that of an Isotropic radiator which is radiating the same total power as the antenna in question but uniformly in all directions. Generally true isotropic radiator does not exist. **Reference:** Discussed in Panacea class.

80. C.

81. A.

82. D.

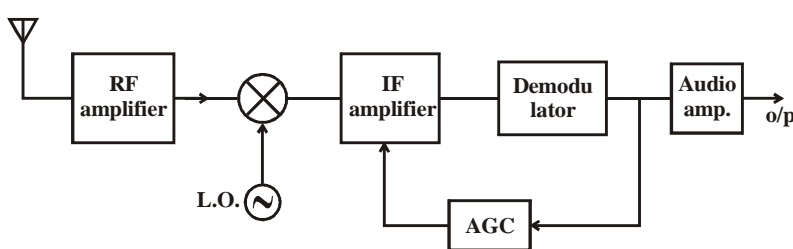


**Reference:** Panacea Microwave theory book page-3

83. D.

84. D Freq<sup>n</sup> reuse. Just by definition

85. A



**Reference:** Panacea communication theory book page-30

86. D.  $(73)_x = (54)_y \Rightarrow 7 \cdot x^1 + 3 = 5 \cdot y^1 + 4 \Rightarrow 7x - 5y = 1$  Just put options

**Reference:** Basic problem

87. B. Need of 4 select lines for 15 inputs

88. A. Storage reduction is not an advantage of sorting

89. A.

90. C.

91. D. Relational Algebra is a query language composed of a no. of operators, each of which takes in relation as arguments and returns a single relation as a result.

92. D. For calculates Max<sup>m</sup> No. of passes through the array by simply subtracts 1 from total no. of elements

93. B. **Reference:** Refer Page 310-Instruction pipeline M. Moris Meno, Computer system architecture

94. C. MIPS is a measurement of program execution speed based on the number of millions of instructions.

$$\text{For a given program } \text{MIPS} = \frac{\text{Instruction count}}{\text{Execution time} \times 10^6}$$

Faster computation will have higher value of MIPS.

There are three problems with using MIPS as a measure for comparing computers.

First, MIPS specifies the instructions execution rate but does not take into account the capabilities of instructions. We can't compare computers with different instruction sets using MIPS, since instruction counts will certainly differ.

Second, MIPS Varies between programs on same computer, thus computer can't have a single MIPS rating.

Finally, If a new program executes more instructions but each instruction is faster then MIPS can vary independently from performance.

**Reference:** Refer Page 53 Computer organization & design by. David A. Patterson John L. Hennerly

95. B. **Reference:** Refer Page 305 M. Moris Meno, Computer system architecture

96. A. In writing the microprogram there are two situations in which one may want to leave a field of microinstruction blank. When a field that controls a functional unit or that causes state to be written (such as memory field of ALU destination field) is blank no control signal should be asserted. When a field only specifies the control of a multiplexer that determines the input to a functional unit, leaving it blank means that one does not care about input to functional unit.

**Reference:** Wai-Kaichen book Page-324

97. B. **Reference:** Panacea Microprocessor theory book

98. D. **Reference:** Panacea Microprocessor theory book

99. C. If Trap flag is set then microprocessor will go into single step mode

100. D. 8086 has 20 address pins. There it has a Main (Directly addressable) memory of 1 Mbytes.

**Reference:** Panacea Microprocessor theory book.

101. A.            102. B

103. B. **Reference:** Discussed this concept in class

104. B. **Reference:** Panacea satellite theory book

105. D. Demultiplexer can be used as a decoder.

**Reference:** It is already available in panacea assignment of digital

106. B. **Reference:** It is already available in panacea assignment of digital

107. B. Both are correct. Tunneling occurs only in Reverse biased case as in Zener diode.

**Reference:** You can also refer Page 744-745 in Milliman-Helikas book. We discussed this topic in detail in Class.

108. A.

| Analog Carrier Systems |            |                    |                        |
|------------------------|------------|--------------------|------------------------|
| # Voice Channels       | Bandwidth  | Spectrum           | Terminology            |
| 12                     | 48 KHz     | 60 – 108 KHz       | Group                  |
| 60                     | 240 KHz    | 312 – 552 KHz      | Supergroup             |
| 300                    | 1.232 MHz  | 812 – 2044 KHz     | CCITT Mastergroup      |
| 600                    | 2.520 MHz  | 564 – 3084 KHz     | Mastergroup            |
| 900                    | 3.872 MHz  | 8.516 – 12.388 MHz | CCITT Supermastergroup |
| 3600                   | 16.984 MHz | .564 – 17.548 MHz  | Jumbogroup             |
| 10800                  | 57.442 MHz | 3.124 – 60.566 MHz |                        |

**Reference:** Discussed this concept in class in detail.

109. B.            110. A            111. A            112. B            113. C            114. B

115. A.            116. B. **Reference:** Refer Panacea microwave theory book page-29

117. A. **Reference:** Refer Panacea microwave theory book

118. C. **Note:-** So geostationary orbit lies in equatorial orbit plane while orbital plane of geosynchronous is inclined to equatorial plane. All geostationary orbits are geosynchronous but reverse is not true. Generally communication satellites are not used in low orbit because they don't provide 24 hours time period.

**Reference:** Refer Panacea satellite theory book page-10.

119. A. Since degree of  $N^r >$  degree of  $D^r$ . so it is a non – causal system

**Causality of a system by Z transforms:**

If  $h[n] = 0$  for  $n < 0$ , Then it is causal system.

In z-domain if  $H(z)$  is in rational form then ROC must be right of the right most pole and degree of  $N^r$  must be less than degree of  $D^r$ . A discrete time LTI system is causal if and only if the ROC of its transfer function is the exterior of a circle including infinity.

**Reference:** Refer Panacea Signal system theory book page-111

120. A. **Reference:** Refer Panacea digital theory book page-76