

MIZORAM PUBLIC SERVICE  
COMMISSION

*Technical Competitive Examinations for  
Recruitment to the post of  
Inspector of Legal Metrology  
under Food, Civil Supplies & Consumer  
Affairs Department*

Time Allowed : 2 hours  
Full Marks : 150

**Electrical & Electronics Engineering Paper-II**

INVIGILATOR

CENTRE SUPERINTENDENT

Date of Exam. : 26/03/2010

**Instructions to candidates:**

- Enter your Roll No. in the box provided on the front page.
- Attempt all the questions.
- Each question is followed by probable answers. Choose the appropriate answer and mark it by putting '✓' mark on the corresponding box.
- If more than one answer boxes are marked for a question, the answer will be treated as wrong.
- On completion, you are to submit the booklet to the Invigilator.

Code Number : .....  
(For Official Use)

Marks Obtained : .....

Examiner

Scrutiniser

MIZORAM PUBLIC SERVICE  
COMMISSION

*Technical Competitive Examinations for  
Recruitment to the post of  
Inspector of Legal Metrology  
under Food, Civil Supplies & Consumer  
Affairs Department*

Time Allowed : 2 hours  
Full Marks : 150

**Electrical & Electronics Engineering Paper-II**

Roll Number :

Date of Exam. : 26/03/2010

Code Number : .....  
(For Official Use)

1. For a second order system with the closed loop function  $T(s) = \frac{9}{s^2 + 4s + 9}$ , the settling time for 2 percent band, in seconds, is

- (a) 1.5 .....       (b) 2.0 .....   
 (c) 3.0 .....       (d) 4.0 .....

2. The gain margin (in dB) of a system having the loop transfer function  $G(s)H(s) = \frac{\sqrt{2}}{s(s+1)}$  is

- (a) 0 .....       (b) 3 .....   
 (c) 6 .....       (d)  $\infty$  .....

3. The system mode described by state equations  $\dot{x} = \begin{pmatrix} 0 & 1 \\ 2 & -3 \end{pmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$      $Y = [1 \quad 1]x$  is

- (a) controllable and observable .....       (b) controllable but not observable .....   
 (c) observable but not controllable .....       (d) neither controllable nor observable ...

4. The phase margin (in degrees) of a system having the loop transfer function  $G(s)H(s) = \frac{2\sqrt{3}}{s(s+1)}$  is

- (a)  $45^\circ$  .....       (b)  $-30^\circ$  .....   
 (c)  $60^\circ$  .....       (d)  $30^\circ$  .....

5. If the closed loop transfer function  $T(s)$  of a unity negative feedback system is given by

$$T(s) = \frac{a_{n-1}s + a_n}{s^n + a_1s^{n-1} + \dots + a_{n-1}s + a_n}, \text{ then the steady state error for a unit ramp input is}$$

- (a)  $\frac{a_n}{a_n - 1}$  .....       (b)  $\frac{a_n}{a_{n-2}}$  .....   
 (c)  $\frac{a_{n-2}}{a_{n-2}}$  .....       (d) zero .....

6. Consider the points  $s_1 = -3 + j4$  and  $s_2 = -3 - j2$  in the s-plane. Then for a system with the open

$$\text{loop transfer function } G(s)H(s) = \frac{K}{(s+1)^4}$$

- (a)  $s_1$  is on the root locus, but not  $s_2$  .....   
 (b)  $s_2$  is on the root locus, but not  $s_1$  .....   
 (c) Both  $s_1$  and  $s_2$  are on the root locus .....   
 (d) Neither  $s_1$  nor  $s_2$  are on the root locus .....

7. For the system described by state equation  $\dot{x} = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0.5 & 1 & 2 \end{pmatrix} x + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$

If the control signal is given by  $u[-0.5 \quad -3 \quad -5]x+v$ , then the eigen values of the closed loop system will be

- (a) 0, -1, -2 .....       (b) 0, -1, -3 .....   
 (c) -1, -1, -2 .....       (d) 0, -1, -1 .....

8. An amplifier with resistive negative feedback has two left half plane poles in its open loop transfer function. The amplifier will be

- (a) always unstable at high frequency .....   
 (b) stable for all frequency .....   
 (c) may be unstable depending on the feedback factor .....   
 (d) oscillate at low frequency .....

9. A system described by the transfer function  $H(s) = \frac{1}{s^3 + \alpha s^2 + ks + 3}$  is stable. The constraints on  $\alpha$  and  $k$  are

- (a)  $\alpha > 0, \alpha k < 3$  .....       (b)  $\alpha > 0, \alpha k > 3$  .....   
 (c)  $\alpha < 0, \alpha k > 3$  .....       (d)  $\alpha < 0, \alpha k < 3$  .....

10. If the characteristic equation of a closed loop system is  $s^2 + 2s + 2 = 0$ , then the system is

- (a) overdamped .....       (b) critically damped .....   
 (c) underdamped .....       (d) undamped .....

11. Open loop dc gain of a unity negative feedback system with closed loop transfer function  $\frac{s+4}{s^2+7s+13}$  is

- (a) 4/13 .....       (b) 4/9 .....   
 (c) 4 .....       (d) 13 .....

12. Consider a system with transfer function  $G(s) = \frac{s+6}{ks^2+s+6}$ . Its damping ratio will be 0.5 when the value of  $k$  is

- (a) 2/6 .....       (b) 3 .....   
 (c) 1/6 .....       (d) 6 .....

13. Which of the following point is not on the root locus of a system with the open loop transfer function

$$G(s)H(s) = \frac{k}{s(s+1)(s+3)}$$

- (a)  $s = -j\sqrt{3}$  .....       (b)  $s = -1.5$  .....   
(c)  $s = -3$  .....       (d)  $s = -\infty$  .....

14. Phase margin of a system with the open loop transfer function  $G(s)H(s) = \frac{(1-s)}{(1+s)(2+s)}$

- (a)  $0^\circ$  .....       (b)  $63.4^\circ$  .....   
(c)  $90^\circ$  .....       (d)  $\infty$  .....

15. The transfer function  $Y(s)/U(s)$  of a system described by the state equation  $\dot{x}(t) = 2x(t) + 2u(t)$  and  $y(t) = 0.5x(t)$  is

- (a)  $0.5/(s-2)$  .....       (b)  $1/(s-2)$  .....   
(c)  $0.5/(s+2)$  .....       (d)  $1/(s+2)$  .....

16. The characteristic polynomial of a system is  $q(s) = 2s^5 + s^4 + 4s^3 + 2s^2 + 2s + 1$ . The system is

- (a) stable .....       (b) marginally stable .....   
(c) unstable .....       (d) oscillatory .....

17. The system with open loop transfer function  $G(s)H(s) = \frac{1}{s(s^2 + s + 1)}$  has a gain margin of

- (a) -6 dB .....       (b) 0 dB .....   
(c) 3.5 dB .....       (d) 6 dB .....

18. A PD controller is used to compensate a system. Compared to the uncompensated system, the compensated system has

- (a) A higher type number .....       (b) Reduced damping .....   
(c) Higher noise amplification .....       (d) Larger transient overshoot .....

19. The root locus of the system  $G(s)H(s) = \frac{1}{s(s+2)(s+3)}$  has the break-away point located at

- (a) -0.5, 0 .....       (b) -2.548, 0 .....   
(c) -4, 0 .....       (d) -0.748, 0 .....

20. Given  $G(s)H(s) = \frac{1}{s(s+2)(s+3)}$ , the point of intersection of the asymptotes of the root loci with the real axis is

- (a) -4 .....       (b) 1.33 .....   
(c) 1 .....       (d) 4 .....

21. A causal system having the transfer function  $H(s) = \frac{1}{(s+2)}$  is excited with  $10u(t)$ . The time at which the output reaches 99% of its steady state value is

- (a) 2.7 sec .....       (b) 2.5 sec .....   
(c) 2.3 sec .....       (d) 2.1 sec .....

22. A system has poles at 0.01 Hz, 1 Hz and 80 Hz, zeroes at 5 Hz, 100 Hz and 200 Hz. The approximate phase of the system response at 20 Hz is

- (a)  $-90^\circ$  .....       (b)  $0^\circ$  .....   
(c)  $90^\circ$  .....       (d)  $-180^\circ$  .....

23. The open loop transfer function of a unity feedback system is  $G(s) = \frac{K}{s(s^2 + s + 2)(s + 3)}$ . The range of K for which the system is stable is

- (a)  $\frac{21}{4} > K > 0$  .....       (b)  $13 > K > 0$  .....   
(c)  $\frac{21}{4} < K < \infty$  .....       (d)  $-6 < K < \infty$  .....

24. For the polynomial  $P(s) = s^5 + s^4 + 2s^3 + 2s^2 + 3s + 15$ , the number of roots which lie in the right half s-plane is

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

25. A linear system is equivalently represented by two sets of state equations  $X=AX+BU$  and  $W=CW+DU$ . The eigen values of the representations are also computed as  $[\lambda]$  and  $[\mu]$ . Which of the following statement is true-

- (a)  $[\lambda]$  and  $[\mu]$  and  $X=W$  .....       (b)  $[\lambda]$  and  $[\mu]$  and  $X \neq W$  .....   
(c)  $[\lambda] \neq [\mu]$  and  $X=W$  .....       (d)  $[\lambda] \neq [\mu]$  and  $X \neq W$  .....   
(e) equal to the group velocity .....

26. Despite the presence of negative feedback, control system still have problems of instability because of
- (a) Components used have nonlinearities .....
  - (b) Dynamic equations of the systems are not known exactly .....
  - (c) Mathematical analysis involves approximations .....
  - (d) System has large negative phase angle at high frequencies .....
27. A ramp input is applied to an unity feedback system results in 5% steady state error. The type number and zero frequency gain of the system are respectively
- (a) 1 and 20 .....  (b) 0 and 20 .....
  - (c) 0 and 1/20 .....  (d) 1 and 1/20 .....
28. The Nyquist plot of  $G(j\omega)H(j\omega)$  for a closed loop control system, passed through  $(-1, j0)$  point in the GH plane. The gain margin of the system in dB is equal to
- (a) infinite .....  (b) greater than zero .....
  - (c) less than zero .....  (d) zero .....
29. The open loop transfer function of a plant is given by  $G(s) = \frac{1}{s^2 + s + 1}$ . If the plant is operated in a unity feedback configuration, then the lead compensator that can stabilize this control system is
- (a)  $\frac{10(s-1)}{s+2}$  .....  (b)  $\frac{10(s+4)}{s+2}$  .....
  - (c)  $\frac{10(s+2)}{s+10}$  .....  (d)  $\frac{10(s-1)}{s+10}$  .....
30. A unity feedback control system has an open loop transfer function  $G(s) = \frac{K}{s(s^2 + 7s + 12)}$ . The gain K for which  $s = -1 + j1$  will lie on the root locus of this system is
- (a) 4 .....  (b) 5.5 .....
  - (c) 6.5 .....  (d) 10 .....
31. A series circuit consists of a 4.7 kW, 5.6 kW, 9 kW and 10 kW. Which resistor has the most voltage across it?
- (a) 4.7 kW .....  (b) 5.6 kW .....
  - (c) 9 kW .....  (d) 10 kW .....

32. A 300W resistor is in series with the parallel combination of four 1 kW resistors. A 100 V source is connected in the circuit. Which resistor will carry the most current through it?

- (a) 330 W .....
- (b) Parallel combination of three 1 kW resistors .....
- (c) Parallel combination of two 1 kW resistors .....
- (d) 1 kW resistor .....

33. Superposition theorem is only valid for

- (a) Linear circuits .....
- (b) Non-linear circuits .....
- (c) Both linear and non-linear circuits .....
- (d) Neither of the two .....

34. Norton's equivalent circuit consists of

- (a) Voltage source in parallel with impedance .....
- (b) Voltage source in series with impedance .....
- (c) Current source in series with impedance .....
- (d) Current source in parallel with impedance .....

35. Reciprocity theorem is applicable to

- (a) Linear networks only .....
- (b) Bilateral networks only .....
- (c) Linear/bilateral networks .....
- (d) Neither of the two .....

36. Compensation theorem is applicable to

- (a) Linear networks only .....
- (b) Nonlinear networks only .....
- (c) Linear and non-linear networks .....
- (d) Neither of the two .....

37. Maximum power is transferred when load impedance is

- (a) Equal to source impedance .....
- (b) Equal to half of the source impedance .....
- (c) Equal to zero .....
- (d) None of the above .....

38. Indicate the dual of the series network consisting of voltage source (V), capacitor (C) and inductor (L) in

- (a) Parallel combination of V, L and C .....
- (b) Series combination of current source, L and C .....
- (c) Parallel combination of current source, L and C .....
- (d) None of the above .....

39. Tie-set schedule gives the relation between

- (a) Branch current and link current .....
- (b) Branch voltage and link currents .....
- (c) Branch current and link voltages .....
- (d) None of the above .....

40. A practical voltage source consists of

- (a) An ideal voltage source in series with an internal impedance .....
- (b) An ideal voltage source in parallel with an internal resistance .....
- (c) Both (a) and (b) are correct .....
- (d) None of the above .....

41. A sine wave voltage is applied across a capacitor, when the frequency of the voltage is increased, the current

- (a) Increases .....
- (b) Decreases .....
- (c) Remains the same .....
- (d) Is zero .....

42. In a pure capacitor, the voltage

- (a) Is in phase with the current .....
- (b) Is out of phase with the current .....
- (c) Lags behind the current by  $90^\circ$  .....
- (d) Leads the current by  $90^\circ$  .....

43. Phasor combination of resistive power and reactive power is called

- (a) True power .....
- (b) Apparent power .....
- (c) Reactive power .....
- (d) Average power .....

44. To which component of an RC circuit is the power dissipation due?

- (a) Capacitance .....
- (b) Resistance .....
- (c) Both .....
- (d) None .....

45. Thevenin impedance  $Z_{TH}$  is found

- (a) By shorting the given two terminals .....
- (b) Between any two open terminals .....
- (c) By removing voltage sources along with the internal impedance .....
- (d) Between same open terminals as for  $V_{TH}$  .....

46. What is the total resistance of a series RLC circuit at resonance?

- (a) Equal to  $X_L$  .....
- (b) Equal to  $X_C$  .....
- (c) Equal to  $R$  .....
- (d) Zero .....



47. In parallel resonant circuit, why does the current lag behind the source voltage at frequencies below resonance?

- (a) Circuit is predominantly resistive .....  (b) Circuit is predominantly inductive .....   
(c) Circuit is predominantly capacitive ....  (d) None of the above .....

48. What is the impedance of an ideal parallel resonant circuit without resistance in either branch?

- (a) Zero .....  (b) Inductive .....   
(c) Capacitive .....  (d) Infinite .....

49. Resultant voltage in a closed balanced circuit delta circuit is

- (a) Three times the phase voltage .....  (b)  $\sqrt{3}$  times the phase voltage .....   
(c) Zero .....  (d) Three times the line voltage .....

50. Mutual inductance is a property associated with

- (a) Only one coil .....   
(b) Two or more coils .....   
(c) Two or more coils with magnetic coupling .....   
(d) For two concentric coils .....

51. The particular integral of the differential equation  $3x^2 + \frac{dx^2}{dy^2} + x \frac{dx}{dy} + y = x$  is

- (a)  $x$  .....  (b)  $x/2$  .....   
(c)  $x/3$  .....  (d)  $x^4$  .....

52. Transient behavior occurs in any circuit when

- (a) There are sudden changes of applied voltage .....   
(b) The voltage source is shorted .....   
(c) The circuit is connected from or disconnected from the supply .....   
(d) All of the above happen .....

53. The transient current in a loss-free LC circuit when excited from an ac source is a/an \_\_\_\_\_ sine wave

- (a) Undamped .....  (b) Overdamped .....   
(c) Underdamped .....  (d) Critically damped .....

54. The Laplace transform of first derivative of a function  $f(t)$  is

- (a)  $F(s)/s$  .....  (b)  $sF(s)-f(0)$  .....   
(c)  $F(s)-f(0)$  .....  (d)  $f(0)$  .....

55. Transfer impedance is defined as

- (a) Ratio of transform voltage and transform current at the same port .....
- (b) Ratio of transform voltage at one port to the current transform at the other port .....
- (c) Both (a) and (b).....
- (d) Ratio between transform of voltage at one port to the transform of voltage at the other port .....

56. The necessary conditions for driving point function is

- (a) Real part of all poles and zeros must not be zero or negative .....
- (b) P(s) and Q(s) may not have any missing terms between the highest and lowest degree unless all even or all odd terms are missing .....
- (c) Degree of P(s) and Q(s) may differ by more than one .....
- (d) Lowest degree in P(s) and Q(s) may differ in degree by more than two .....

57. A polynomial must satisfy the condition that

- (a) Z(s) is a real function .....
- (b) All the roots of P(s) have zero real parts or negative real parts .....
- (c) Both (a) and (b).....
- (d) None of the above .....

58. Hurwitz polynomial possesses one of the conditions that

- (a) All the quotients in the polynomial P(s) must be positive .....
- (b) The roots of P(s) must lie on the right half s-plane .....
- (c) Ratio of P(s) and P'(s) gives negative quotient .....
- (d) P(s) may have missing terms .....

59. In the first Foster form, the presence of first element capacitor  $C_0$  indicates

- (a) Pole at  $w = 0$  .....
- (b) Pole at  $w = \text{infinity}$  .....
- (c) Zero at  $w = 0$  .....
- (d) Zero at  $w = \text{infinity}$  .....

60. The function is said to be positive real, when

- (a) Poles and zeros lie on the right half s-plane .....
- (b) Poles and zeros lie on the left half s-plane .....
- (c) Poles and zeros are simple and lie on the imaginary axis .....
- (d) Both (b) and (c).....

61. Bandwidth (BW) of 8PSK, 16PSK modulated signals are

- (a)  $\frac{1}{2} R_b, 2R_b$  .....  (b)  $\frac{2}{3}R_b, R_b$  .....   
(c)  $R_b, 2R_b$  .....  (d)  $\frac{2}{3}R_b, \frac{1}{2}R_b$  .....

62. An optical source is emitting 20 $\mu$ dB, if there is banding loss of 2dB, Joint loss of 1dB. What should be the sensitivity of the receiver?

- (a) 0.15  $\mu$ dB .....  (b) 3 dB .....   
(c) 6.67  $\mu$ dB .....  (d) 17  $\mu$ dB .....

63. For a uniform quantizer with a sinusoidal signal as an input with assumption that quantization error is distributed uniformly, if we increase resolution by 2 bits how much improvement in terms of SNR(dB)

- (a) 12dB .....  (b) 6 dB .....   
(c) 10 dB .....  (d) 2 dB .....

64. A signal with a desired bandwidth of 3 KHz with a certain undesired spikes at 18 KHz and 24 KHz. Now if the signal is sampled at 8 KHz, certainly aliasing takes place. So at where in the desire BW, the two aforesaid mentioned spikes will appear?

- (a) 0, 1 KHz .....  (b) 2 KHz, 0 .....   
(c) 1 KHz, 4 .....  (d) 4 KHz, 2 KHz .....

65. In a seven cell reused mobile cellular system, how many co-channels in the 1<sup>st</sup> and 2<sup>nd</sup> tiers of co-channel cells.

- (a) 4, 6 .....  (b) 4, 8 .....   
(c) 6, 12 .....  (d) 8, 16 .....

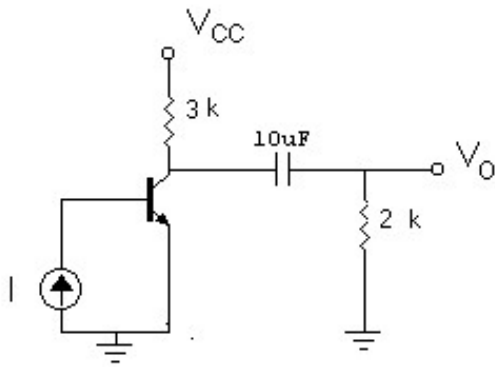
66. In between NRZ and RZ which one takes more Bandwidth and better synchronization?

- (a) NRZ .....  (b) RZ .....   
(c) same .....  (d) none .....

67. Ratio between SNR and  $E_b/N_o$  of a signal is as follows

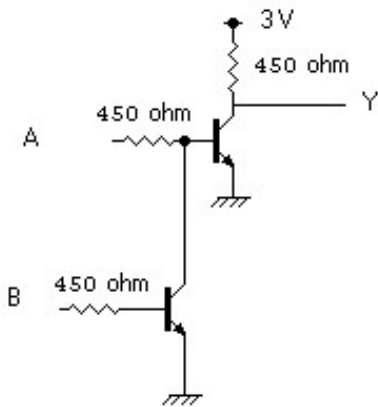
- (a)  $R_b$  .....  (b)  $2 R_b W$  .....   
(c)  $R_b /W$  .....  (d)  $2 R_b /W$  .....

68. The lower cut-off frequency of the following transistor stage is



- (a) 7.95 kHz .....       (b) 13.25 Hz .....   
 (c) 5.3 KHz .....       (d) 3.18 kHz .....

69. Logic expression for Y in terms of logical variables A and B is

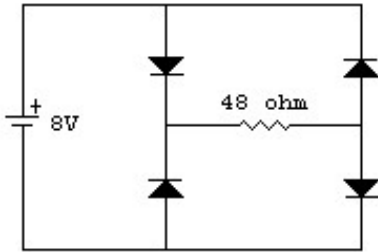


- (a)  $\bar{A} + B$  .....       (b)  $A + \bar{B}$  .....   
 (c)  $A + B$  .....       (d)  $\bar{A} + \bar{B}$  .....

70. In class-A power amplifier the collector dissipation is maximum when

- (a) No signal is present .....       (b) Signal swing is maximum .....   
 (c) Signal swing is (1/2) of its maximum ..       (d) None of the above .....

71. If cut-in voltage and forward resistance of each diode are 0.7 V and 1 $\Omega$  respectively, the current through 48 $\Omega$  resistor in the following circuit is -



- (a) 132mA .....       (b) 60 mA .....   
 (c) 0 mA .....       (d) 1/6 mA .....

72. The average conversion time of an ADC using an eight stage counter with a clock frequency of 2MHz is

- (a) 128 us .....       (b) 64 us .....   
 (c) 32 us .....       (d) 256 us .....

73. A silicon sample A is doped with  $5 \times 10^{17} \text{ cm}^{-3}$  of n-type impurity and another sample B with identical dimensions is doped with of p-type impurity. If the ratio of electron to hole mobility is 2, the ratio of conductivity of the sample A to B is (assume that all the dopants are ionized)

- (a) 1/5 .....       (b) 1/10 .....   
 (c) 1 .....       (d) 3/4 .....

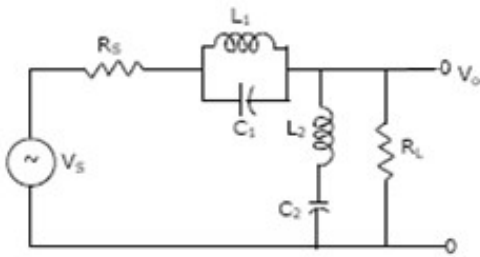
74. Consider an n-channel MOSFET having the parameters  $V_{TN}=1\text{V}$ ,  $(1/2)m_n C_{ox}=20\text{mA/V}^2$  and  $W/L=40$ . Assume that the transistor is biased in the saturation region with  $I_{DQ}=1\text{mA}$ . Calculate the value of the trans-conductance  $g_m$ .

- (a) 2.56 mA/V .....       (b) 1.79 mA/V .....   
 (c) 1.87 mA/V .....       (d) 1.65 mA/V .....

75. As compared to the unipolar device, the bipolar device has

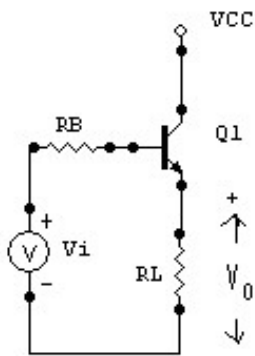
- (a) High noise margin .....       (b) Low transconductance .....   
 (c) Low packing Density .....       (d) None .....

76. The given circuit represents a



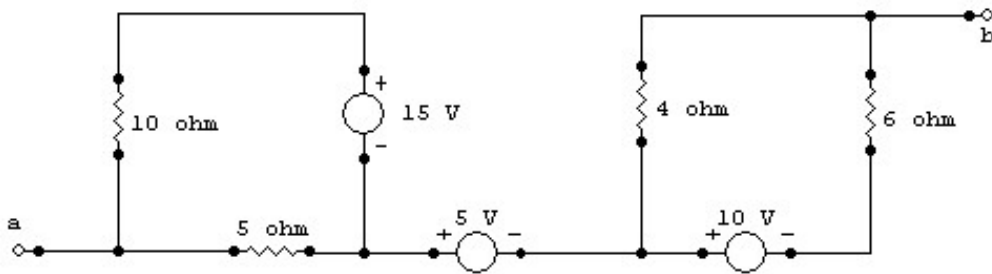
- (a) High pass filter .....       (b) Low pass filter .....   
 (c) Band pass filter .....       (d) Band reject filter .....

77. The configuration of the transistor in the circuit shown is



- (a) CB .....       (b) CE .....   
 (c) CC .....       (d) Both CC and CE .....

78. In the network shown below, the voltage between points a and b is



- (a) 14 V .....       (b) 5 V .....   
 (c) 10 V .....       (d) None of the above .....

79. The phenomenon known as “Early Effect” in a bipolar transistor refers to a reduction of the effective base-width caused by
- (a) electron-hole recombination at the base .....
  - (b) the reverse biasing of the base-collector junction .....
  - (c) the forward biasing of emitter-base junction .....
  - (d) the early removal of stored base charge during saturation-to-cutoff switching .....
80. Consider the following statements S1 and S2.  
S1: The  $\beta$  of a bipolar transistor reduces if the base width is increased.  
S2: The  $\beta$  of a bipolar transistor increases if the doping concentration in the base is increased.  
Which one of the following is correct?
- (a) S1 is FALSE and S2 is TRUE .....
  - (b) Both S1 and S2 are TRUE .....
  - (c) Both S1 and S2 are FALSE .....
  - (d) S1 is TRUE and S2 is FALSE .....
81. Boron is implanted into an n-type Si sample with a concentration of  $N_d = 10^{16} \text{ cm}^{-3}$  forming an abrupt junction of square cross-section with an area of  $2 \times 10^{-3} \text{ cm}^2$ . If the acceptor concentration in the p-type material is  $N_a = 4 \times 10^{18} \text{ cm}^{-3}$ , the built-in potential  $V_{bi}$  at 300K is given by
- (a) 0.85V .....
  - (b) 0.24V .....
  - (c) 0.38V .....
  - (d) 0.6V .....
82. The relationship between  $I$  &  $V$  for a junction diode is given by  $I = I_0 (e^{V/(2\phi_t)} - 1)$ . The junction diode is
- (a) Silicon diode .....
  - (b) Germanium diode .....
  - (c) GaAs diode .....
  - (d) Palladium diode .....
83. In an 8086 microprocessor, the code segment (CS) register contains 2500H and index pointer (IP) contains 1000H. What will be the address of the physical memory location?
- (a) 25000H .....
  - (b) 25500H .....
  - (c) 27000H .....
  - (d) 26000H .....
84. In an 8085 microprocessor using three byte instruction, the lower order address byte is placed in the memory first followed by the higher order address byte. This is because of the design of
- (a) Instruction decoder and address bus .....
  - (b) Instruction decoder and microprogram .....
  - (c) Microprogram and address bus .....
  - (d) Address bus and ALU .....

85. BCD code is

- (a) error correcting code .....
- (b) error detecting code .....
- (c) both (a) & (b) .....
- (d) none of the above .....

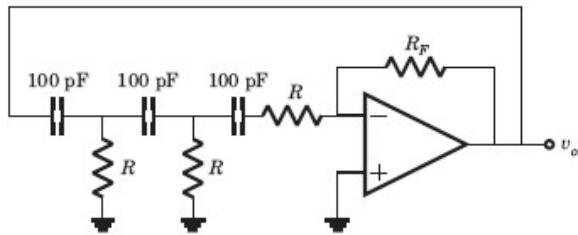
86. For a given guided mode, the normalized propagation lies between

- (a)  $-\infty$  and  $+\infty$  .....
- (b) 0 and  $+\infty$  .....
- (c) 0 and 1 .....
- (d) -1 and +1 .....

87. In an 8085 microprocessor a decade counter can be designed by using either up counting or by down counting. Specify which of the following statement is correct?

- (a) Up counter requires more hardware and generate more delay than down counter .....
- (b) Down counter requires more hardware and generate more delay than up counter .....
- (c) Up counter requires less hardware and generate less delay than down counter .....
- (d) Down counter requires less hardware and generate less delay than up counter .....

88. The phase shift oscillator of fig. below operates at  $f = 80$  kHz. The value of resistance  $R_F$  is



- (a) 148 kW .....
- (b) 236 kW .....
- (c) 438 kW .....
- (d) 814 kW .....

89. A system whose impulse response is zero outside of some finite interval is termed as

- (a) FIR .....
- (b) IIR .....
- (c) either FIR or IIR .....
- (d) none of the above .....

90. To design an oscillator, the poles of the closed loop transfer function should lie

- (a) On the real axis .....
- (b) To the left half of the S-plane .....
- (c) To the right half of the S-plane .....
- (d) On the imaginary axis .....

91. A transistor is connected in a negative feedback amplifier circuit using Voltage-series topology. The effect of negative feedback on the input and output resistances of the amplifier circuit will be:

- (a) Input resistance increases and output resistance decreases .....
- (b) Input resistance decreases and output resistance increases .....
- (c) Both input and output resistance increases .....
- (d) Both input and output resistance decreases .....



92. A differential amplifier is invariably used in the input stage of all amplifiers. This is done basically to provide the op-amp with high

- |                     |                          |                          |                          |
|---------------------|--------------------------|--------------------------|--------------------------|
| (a) CMRR .....      | <input type="checkbox"/> | (b) BW .....             | <input type="checkbox"/> |
| (c) Slew Rate ..... | <input type="checkbox"/> | (d) Open Loop gain ..... | <input type="checkbox"/> |

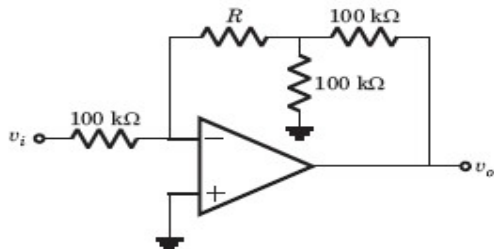
93. In an LED which of the following factors effect most severely the efficiency of the diode?

- |                                     |                          |                         |                          |
|-------------------------------------|--------------------------|-------------------------|--------------------------|
| (a) Fresnel reflection .....        | <input type="checkbox"/> | (b) Back emission ..... | <input type="checkbox"/> |
| (c) Total internal reflection ..... | <input type="checkbox"/> | (d) Absorption .....    | <input type="checkbox"/> |

94. Practically, in order to create an electron-hole pair in a P-N junction diode, the energy of the incident photon should be

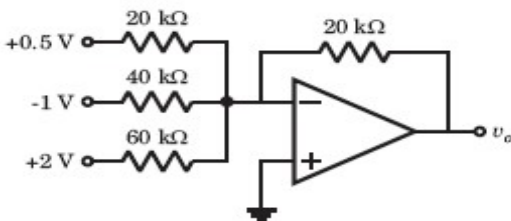
- |                                     |                          |                                 |                          |
|-------------------------------------|--------------------------|---------------------------------|--------------------------|
| (a) Less than the band gap .....    | <input type="checkbox"/> | (b) Equal to the band gap ..... | <input type="checkbox"/> |
| (c) Greater than the band gap ..... | <input type="checkbox"/> | (d) None of the above .....     | <input type="checkbox"/> |

95. For the circuit shown below, gain is . The value of  $R$  is



- |                  |                          |                  |                          |
|------------------|--------------------------|------------------|--------------------------|
| (a) 600 kW ..... | <input type="checkbox"/> | (b) 450 kW ..... | <input type="checkbox"/> |
| (c) 4.5 MW ..... | <input type="checkbox"/> | (d) 6 MW .....   | <input type="checkbox"/> |

96. In the circuit shown below, the output voltage is



- |                  |                          |                   |                          |
|------------------|--------------------------|-------------------|--------------------------|
| (a) 2.67 V ..... | <input type="checkbox"/> | (b) -2.67 V ..... | <input type="checkbox"/> |
| (c) -6.67 .....  | <input type="checkbox"/> | (d) 6.67 V .....  | <input type="checkbox"/> |

97.  $y(n) = (n+1)x(n)$  is a

- |                                 |                          |                               |                          |
|---------------------------------|--------------------------|-------------------------------|--------------------------|
| (a) time invariant system ..... | <input type="checkbox"/> | (b) time variant system ..... | <input type="checkbox"/> |
| (c) Nonlinear system .....      | <input type="checkbox"/> | (d) None of the above .....   | <input type="checkbox"/> |

98. In the circuit shown below, between the terminal 1 and 2 an a.c. voltage source of frequency 400 Hz is connected. Another a.c. voltage of 1.0 MHz is connected between 3 and 4. The output between 5 and 6 contains components at

- (a) 400 Hz, 1 MHz, 1000.4 kHz, 999.6 kHz .....
- (b) 1 MHz, 1000.4 kHz, 999.6 kHz .....
- (c) 400 Hz, 1000.4 kHz, 999.6 kHz .....
- (d) 1000.4 kHz, 999.6 kHz .....

99. The characteristic equation of a T flip-flop is

- (a)  $T\bar{Q} + \bar{T}Q$  .....
- (b)  $TQ + \bar{T}\bar{Q}$  .....
- (c)  $TQ$  .....
- (d)  $T\bar{Q}$  .....

100. In FM signal, the power

- (a) Increases as the modulation index increases .....
- (b) Reduces as the modulation index increases .....
- (c) Increases as the modulation index decreases .....
- (d) Remains constant when the modulation index increases .....

101. A signed integer has been stored in a byte using 2's complement format. We wish to store the same integer in 16-bit word. We should copy the original byte to the less significant byte of the word and fill the more significant byte with

- (a) 0 .....
- (b) 1 .....
- (c) Equal to the MSB of the original byte .....
- (d) Complement of the MSB of the original byte .....

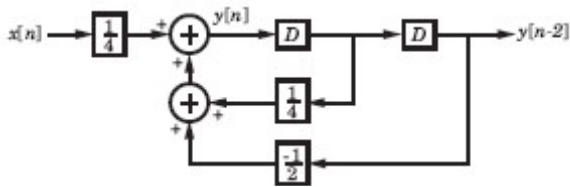
102. If  $|H(\omega)|^2 = H(\omega)H(-\omega)$  then

- (a)  $h(n)$  has imaginary value .....
- (b)  $h(n)$  has real value .....
- (c)  $h(n)$  has any value .....
- (d)  $h(n)$  has positive value .....

103.  $\sqrt{100} = 10$  is true in \_\_\_\_\_ base

- (a) Any .....
- (b) 6 .....
- (c) 5 .....
- (d) 10 .....

104. The system shown below is



- (a) Stable and causal .....       (b) Stable but not causal .....   
 (c) Causal but unstable .....       (d) Unstable but not causal .....

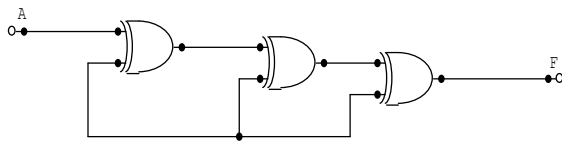
105. A silicon crystal having a cross-sectional area of  $0.001 \text{ cm}^2$  and a length of 20 mm is connected to its ends to a 20 battery. At  $T= 300 \text{ K}$ , we want a current of 100 mA in crystal. The concentration of donor atoms to be added is

- (a)  $2.4 \times 10^{13} \text{ cm}^{-3}$  .....       (b)  $4.6 \times 10^{13} \text{ cm}^{-3}$  .....   
 (c)  $7.8 \times 10^{14} \text{ cm}^{-3}$  .....       (d)  $8.4 \times 10^{14} \text{ cm}^{-3}$  .....

106. In the Hamming code 1001101, error has occurred at \_\_\_\_\_ position.

- (a) 4 .....       (b) 5 .....   
 (c) 1 .....       (d) 7 .....

107. For the following circuit the output F= is



- (a) 0 .....       (b) 1 .....   
 (c) A .....       (d)  $\bar{A}$  .....

108. Consider the statements below:

- A. If the output waveform from an OR gate is the same as the waveform at one of its inputs, the other input is being held permanently LOW.  
 B. If the output waveform from an OR gate is always HIGH, one of its input is being held permanently HIGH

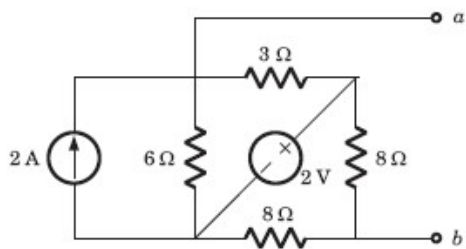
The statement, which is always true, is

- (a) Both A and B .....       (b) Only A .....   
 (c) Only B .....       (d) None of the above .....

109. A line comprised of two copper wires of diameter 1.2 mm that have 3.2 mm center to center spacing. If the wires are separated by a dielectric material with  $\epsilon_r = 3.5$ , the value of characteristic impedance  $Z_0$

- (a) 96  $\Omega$  .....       (b) 150  $\Omega$  .....   
 (c) 74  $\Omega$  .....       (d) 105  $\Omega$  .....

110. The Thevenin's impedance across the terminals ab of the network shown below is



- (a) 2 W .....       (b) 6 W .....   
 (c) 6.16 W .....       (d) 4/3 W .....

111. Measurement of Hall coefficient in a semiconductor provides information on the

- (a) sign and mass of charge carriers .....   
 (b) mass and concentration of charge carriers .....   
 (c) sign of charge carriers alone .....   
 (d) sign and concentration of charge carriers .....

112. If the lattice temperature is increased, then the coefficient of a semiconductor will

- (a) decrease .....   
 (b) increase .....   
 (c) first increase to a peak and then decrease .....   
 (d) remain constant .....

113. Consider the following statements: pure germanium and pure silicon are examples of

- (i) direct band-gap semiconductors,  
 (ii) indirect band-gap conductors  
 (iii) degenerate semiconductors

Of these statements

- (a) (i) alone is correct .....       (b) (ii) alone is correct .....   
 (c) (iii) alone is correct .....       (d) (i) and (iii) are correct .....

114. A bridge rectifier is preferred over an ordinary two-diode full wave rectifier because

- (a) it needs much smaller transformer for same output .....   
 (b) its transformer has no centre tap .....   
 (c) it uses four diodes .....   
 (d) it has high safety factors .....

115. Bulk resistance of a diode is

- (a) sum of resistance values of n-material and p-material .....
- (b) sum of half the resistance values of n-material and p-material .....
- (c) equivalent resistance of the resistance value of p and n-material in parallel .....
- (d) none of the above .....

116. LEDs fabricated from GaAs permit radiation in the

- (a) UV region .....
- (b) IR region .....
- (c) Visible range .....
- (d) None of the above .....

117. Avalanche breakdown basically results due to

- (a) Impact ionization .....
- (b) Strong electric field across the junction .....
- (c) Emission of electrons .....
- (d) Rise in temperature .....

118. A BJT is said to be in saturation if

- (a) Both junctions are reverse biased .....
- (b) Base-emitter junction is reverse biased and base collector is forward biased .....
- (c) Base-emitter junction is forward biased and base collector is reverse biased .....
- (d) Both the junctions are forward biased .....

119. Ebers-Moll model is applicable to

- (a) BJT .....
- (b) NMOS transistor .....
- (c) UJT .....
- (d) JFET .....

120. Modulation of effective base width by collector voltage is known as early effect, hence reverse collector voltage

- (a) increases both alpha and beta .....
- (b) decreases both alpha and beta .....
- (c) increases alpha but decreases beta ...
- (d) decreases alpha but increases beta ...

121. As compared to power MOSFET, a BJT has

- (a) Lower switching losses but higher conduction losses .....
- (b) Higher switching losses and higher conduction losses .....
- (c) Higher switching losses but lower conduction losses .....
- (d) Lower switching losses and lower conduction losses .....

122. Choose the correct statement

- (a) MOSFET has positive temperature coefficient (TC) whereas BJT has negative TC .....
- (b) Both MOSFET and BJT have positive TC .....
- (c) Both MOSFET and BJT have negative TC .....
- (d) MOSFET has negative TC whereas BJT has positive TC .....

123. Choose the correct statement

- (a) Both MOSFET and BJT are voltage controlled device (CDs) .....
- (b) Both MOSFET and BJT are current CDs .....
- (c) MOSFET is a voltage CD whereas BJT is a current CD .....
- (d) MOSFET is a current CD whereas BJT is a voltage CD .....

124. An SCR can be brought to forward conducting state with gate circuit open when the applied voltage exceeds

- (a) Forward breakover voltage .....
- (b) Reverse breakdown voltage .....
- (c) 1.5V .....
- (d) Peak non-repetitive off-state voltage .....

125. In thyristor, holding current is

- (a) More than latching current .....
- (b) Less than latching current .....
- (c) Equal to latching current .....
- (d) Very small. ....

126. Forward voltage drop during SCR turn-on is 1.5V this drop remains

- (a) Remains constant and is independent of load current .....
- (b) Increases slightly with load current .....
- (c) Decreases slightly with load current .....
- (d) Varies linearly with load current .....

127. Once the SCR starts conducting a forward current, its gate loses control over

- (a) Anode circuit voltage only .....
- (b) Anode circuit current only .....
- (c) Anode circuit current and voltage .....
- (d) Anode circuit current, voltage and time .....

128. In UJT, maximum value of charging resistance is associated with

- (a) Peak point .....
- (b) Valley point .....
- (c) Any point between peak and valley point .....
- (d) After the valley point .....

129. Practical way of obtaining static voltage equalization in series connected SCRs is by the use of

- (a) One resistor across the string .....
- (b) Resistors of different values across each SCR .....
- (c) Resistor of the same value across each SCR .....
- (d) One resistor in series with the string .....

130. The function of connecting a zener diode in an UJT circuit, used for triggering of SCRs, is to be

- (a) Expedite the generation of triggering pulses .....
- (b) Delay the generation of triggering pulses .....
- (c) Provide a constant voltage to UJT to prevent erratic firing .....
- (d) Provide a variable voltage to UJT as the source voltage changes .....

131. For a single phase half-wave controlled rectifier has  $400\sin 314t$  as the input voltage and R as the load. For a firing angle of  $60^\circ$  for the SCR, the average output voltage is

- (a)  $400/\pi$  .....       (b)  $300/\pi$  .....
- (c)  $240/\pi$  .....       (d)  $200/\pi$  .....

132. In controlled rectifiers, the nature of load current is continuous or discontinuous

- (a) Does not depend on type of load and firing angle delay .....
- (b) Depends both on the type of load and firing angle delay .....
- (c) Depends only on type of load .....
- (d) Depends only on the firing angle delay .....

133. The effect of source inductance on the performance of a single-phase and three-phase full converter is to

- (a) Reduce the ripples in the output load current .....
- (b) Make discontinuous current as continuous .....
- (c) Reduce output voltage .....
- (d) Increase the load voltage .....

134. In dc chopper. If  $T_{on}$  is the on-time and  $f$  is the chopping frequency, then output voltage in terms on input voltage,  $V_s$  is given by

- (a)  $V_s * T_{on} / f$  .....       (b)  $V_s * f / T_{on}$  .....   
(c)  $V_s / f * T_{on}$  .....       (d)  $V_s * f * T_{on}$  .....

135. Which of the following is correct for inverters?

- (a) VSI and CSI both require feedback diodes .....   
(b) Only CSI requires feedback diodes .....   
(c) GTOs can be used in CSI .....   
(d) Only VSI requires feedback diodes .....

136. Noise figure of a communication system ( $T_{eq}$  is equivalent noise temperature)

- (a) Varies linearly with  $T_{eq}$  .....       (b) Varies with  $1 / T_{eq}$  .....   
(c) Varies linearly with  $T_{eq}^2$  .....       (d) does not vary with  $T_{eq}$  .....

137. In an AM transmitter, peak antenna current is 13A and the minimum current is 7A. The percentage modulation is

- (a) 20% .....       (b) 30% .....   
(c) 50% .....       (d) 100% .....

138. Which one of the following is an indirect way of generating FM

- (a) Armature modulator .....   
(b) Reactance bipolar transistor modulator .....   
(c) Reactance FET modulator .....   
(d) Varactor diode modulator .....

139. De-emphasis is used to

- (a) To attenuate high modulation frequency .....   
(b) To attenuate low modulation frequency .....   
(c) To attenuate mid-band modulation frequency .....   
(d) To reduce overall modulation index .....

140. A source delivers symbols  $X_1, X_2, X_3$  and  $X_4$  with probabilities  $1/2, 1/4, 1/8$  and  $1/8$  respectively. The entropy of the system is

- (a) 1.75 bits per sec .....       (b) 1.75 bits per symbol .....   
(c) 1.75 symbols per second .....       (d) 1.75 symbols per bit .....



141. A receiver has a noise resistance of  $50\Omega$ . It is connected to an antenna with an input resistance of  $50\Omega$ . The noise figure of the system is
- (a) 1 .....  (b) 2 .....   
(c) 50 .....  (d) 101 .....
142. A 10 kW carrier is sinusoidally modulated by two carriers corresponding to a modulation index of 30% and 40% respectively. The total radiated power is
- (a) 11.25 kW .....  (b) 12.5 kW .....   
(c) 15 kW .....  (d) 17 kW .....
143. In phase modulation, the frequency deviation is
- (a) Independent of the modulating signal frequency .....   
(b) Inversely proportional to the modulating signal frequency .....   
(c) Directly proportional to the modulating signal frequency .....   
(d) Inversely proportional to the square root of the modulating signal frequency .....
144. An arbitrary signal  $m(t)$  has zero average value and is bandlimited to 3.2 kHz. It is sampled at the rate of 8K samples per second. The samples are passed through an ideal bandpass filter with centre frequency of 32 kHz and bandwidth of 6.4 kHz. The output of the bandpass filter is
- (a) AM-DSB with suppressed carrier .....   
(b) AM-DSB with carrier .....   
(c) AM-SSB signal with carrier .....   
(d) A sequence of exponentially decaying sine waves .....
145. Correct sequence of subsystems in an FM receiver is
- (a) Mixer, RF amplifier, limiter, IF amplifier, discriminator, audio amplifier .....   
(b) RF Amplifier, Mixer, IF amplifier, limiter discriminator, audio amplifier .....   
(c) RF Amplifier, Mixer, limiter, discriminator, IF amplifier, audio amplifier .....   
(d) Mixer, IF amplifier, limiter, audio amplifier, discriminator .....
146. The bandwidth of N-bit binary coded PCM signal for modulating a signal having bandwidth of  $f$  Hz is
- (a)  $1/N$  Hz .....  (b)  $1/N^2$  Hz .....   
(c)  $Nf$  Hz .....  (d)  $N^2f$  Hz .....

147. Time division multiplexing requires

- (a) Constant data transmission .....
- (b) Transmission of data samples .....
- (c) Transmission of data random .....
- (d) Transmission of data of one measurand .....

148. A telephone channel has bandwidth B of 3 kHz and SNR (S/hB) of 30 dB. It is connected to a teletype machine having 32 different symbols. The symbol rate required for errorless transmission is nearly

- (a) 1800 symbols/sec .....
- (b) 3000 symbols/sec .....
- (c) 5000 symbols/sec .....
- (d) 6000 symbols/sec .....

149. Quadrature multiplexing is

- (a) Same as FDM .....
- (b) Same as TDM .....
- (c) A combination of TDM and FDM .....
- (d) Scheme where the same carrier frequency is used for two different signals .....

150. A ramp signal  $m(t) = at$  is applied to a delta modulator with sampling period  $T_s$  and step size d. Slope overload distortion would occur if

- (a)  $d < a$  .....
- (b)  $d > a$  .....
- (c)  $d < aT_s$  .....
- (d)  $d > aT_s$  .....

\* \* \* \* \*