Answer key: ECE-2005

1		**2**	C	**3**	4	**4**	B	**5**	A	**6**	C	**7**	C
8	B	**9**	B	**10**	C	**11**	C	**12**	B	**13**	C	**14**	D
15	B	**16**	D	**17**	B	**18**	B	**19**		**20**	B	**21**	D
22	D	**23**	A	**24**	C	**25**	B	**26**	D	**27**	D	**28**	C
29	B	**30**	C	**31**	A	**32**	C	**33**	A	**34**	A	**35**	C
36	C	**37**	C	**38**	A	**39**	B	**40**	C	**41**	C	**42**	D
43	B	**44**	B	**45**	B	**46**	C	**47**	D	**48**	A	**49**	D
50	A	**51**	B	**52**	C	**53**	C	**54**	A	**55**	C	**56**	C
57	B	**58**	D	**59**	A	**60**	C	**61**	B	**62**	B	**63**	B
64	C	**65**	B	**66**		**67**	A	**68**	C	**69**	A	**70**	A
71	C	**72**	C	**73**	D	**74**	C	**75**	D	**76**	D	**77**	C
78	B	**79**	A	**80**	B	**81**		**82**	D,D	**83**	B,A	**84**	C,A
85	A,C												

Explanations:

1. (A) Direct question

2. ( )

3. (D) $\frac{1}{2}\times\frac{1}{2}$

4. (B) $D^2-5D+6=0;(D-2)(D-3)=0;D=2,3;y=e^{2x}+e^{3x}$

5. (A) $u_e(t)=\frac{1}{2};u_0(t)=\frac{1}{2}\text{sgn}(t)=\frac{1}{2}x(t)$

   $\because x(t)=\text{sgn}(t)$

6. (C) First term is right handed sequence and second term is L.H. sequence. Hence intersection of both ROCs

7. (C) Characteristic equation is $s^2+\frac{Rs}{L}+\frac{1}{LC}=0$

   for no oscillations,

$$b^2-4ac\geq 0$$

$$\frac{R^2}{L^2}\geq\frac{4}{LC}\Rightarrow R\geq 2\sqrt{\frac{L}{C}}$$

$$\begin{bmatrix} V_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} n & 0 \\ 0 & X \end{bmatrix}; V_1 = nV_2; I_1 = -XI_2$$

8. (B) $\frac{V_1}{V_2} = n = \frac{I_2}{I_1}$

$\therefore X = \frac{1}{n}$ [neglecting -ve sign]

9. (B) $w = \frac{1}{\sqrt{LC}} = \frac{\sqrt{400}}{\sqrt{10^{-6}}} = 20 \times 10^3; f = \frac{\omega}{Q\pi} = \frac{10^4}{\pi}$

10. (C) Using MPT, $R_L = 100\Omega$; $P_{RL} = \frac{V^2}{4R_L} = \frac{100}{4 \times 100} = 0.25\omega$

11. (C)

12. (B) I_{CO} doubles for 10°C rise in temperature

13. (C)

14. (D)

15. (A) 10K□30K

16. ()

17. (B)

18. (B)

19. (A) Let O/P of 1st mux be E,

$\therefore$

B	E
0	C
1	$\bar{C}$

$\therefore$ E = $B\bar{C} + \bar{B}C$

Now f = EA = $A\left(B\bar{C} + \bar{B}C\right)$

20. (B)

21. (D) $y\left(e^{j0}\right) = \sum_{n-0}^{\infty} y(n) = \sum_{n=0}^{\infty} \left(\frac{1}{2}\right)^{2n} = \sum_{n=0}^{\infty} \left(\frac{1}{4}\right)^{n} = \frac{1}{1 - \frac{1}{4}} = \frac{4}{3}$

22. (D)

23. (A) $\left(\frac{8}{\sqrt{2}}\right)^2 + \left(\frac{4}{\sqrt{2}}\right)^2 = \frac{8^2 + 4^2}{2} = \frac{64 + 16}{2} = 40$

24. (C)

25. (B) Eigen values of a linear system are same through representation of a system by state equation may be different

26. (D) Check with $\frac{1}{s + ST}$ @ω=0 and ω=∞

27. ()

28. (C)

$$\overline{H} = H_0 \sin(\omega t p \beta x + \phi)\, a_y$$

$$\omega = 5 \times 10^4, \beta = 0.004$$

$$V_p = \frac{\omega}{\beta} = \frac{5 \times 10^4}{0.004} = 1.25 \times 10^7 m/s.$$

since $\vec{H}$ is in +ve y, $\vec{E}$ in z, propagation in -ve $\times$ dim

else $\vec{H}$ would have been $H_0 \sin(\omega t - \beta x)$ for +ve x dim propagation

$\therefore V_p = -1.25\times10^7$ m/s.

29. (B)

30. (C)

$$V_p \text{ in glass} = \frac{3 \times 10^8}{\eta} = \frac{3 \times 10^8}{1.5} = 2 \times 10^8 = f\lambda$$

$$\therefore \lambda = 2\mu m$$

31. ()

32. (C) Eigen values are 4, -5.

To find eigen vector (λI- A) (x) =0

$$\begin{bmatrix} \lambda + 4 & -2 \\ -4 & \lambda - 3 \end{bmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = 0$$

for λ=4, $8x_1 = 2x_2$, $4x_1 = x_2$ $\begin{bmatrix} 1 \\ 4 \end{bmatrix}$ not in choice.

for λ=-5, $-x_1 = 2x_2$ $\begin{bmatrix} -1 \\ 1 \end{bmatrix}$ or $\begin{bmatrix} 2 \\ -1 \end{bmatrix} \rightarrow [C]$

$$AA^{-1} = I$$

33. (A) $A^{-1} = \frac{1}{6}\begin{bmatrix} 3 & 0.1 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} \frac{1}{2} & \frac{1}{60} \\ 0 & \frac{1}{3} \end{bmatrix}$

$$a + b = \frac{1}{60} + \frac{20}{60} = \frac{21}{60} = \frac{7}{20}$$

34. (A) The integral is of Gaussian type with mean 0 and variance 4

$$\frac{1}{\sigma\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-\frac{(x-\mu)^2}{2\sigma^2}} dx = 1$$

Now if $\mu = 0$,

$$\text{I} = \frac{\text{area under } x(t)}{x} = 1$$

$$\text{Area} = \frac{2}{2\sqrt{2\pi}} \int_0^{\infty} e^{-\frac{x^2}{8}} dx = 1$$

$\therefore$ Area = I = 1

35. (C) $\frac{d}{dx} e^{-x^2} = -2xe^{-x^2} \rightarrow$ odd fucntion

36. (C)

37. (A) $AA^T = \begin{bmatrix} 4 & 0 & 0 & 0 \\ 0 & 4 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 2 \end{bmatrix} = B; B^{-1} = \begin{bmatrix} \frac{1}{4} & 0 & 0 & 0 \\ 0 & \frac{1}{4} & 0 & 0 \\ 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & \frac{1}{2} \end{bmatrix}$

38. (A) $10\angle 60 - 5\angle 0 = \frac{10\sqrt{3}}{2}\angle 90°$

39. (B) j(5+2+2+2×10 - 2×10)=j9

40. ()

41. (C) $V_a = 5V; V_b = \frac{10 \times 1.1}{2.1} = 5.238$

$V_{ab} = -0.238$

42. (D)

$V_1 = h_{11}i_1 + h_{12}V_2$

$I_2 = h_{21}i_1 + h_{22}V_2$

for V_2 = 0, h_{11} = 10Ω

h_{21} = -1

$\because i_2 = -i_1$

43. (B) Differention ckt

44. (B) $\frac{\sigma_A}{\sigma_B} = \frac{n_A e \mu_b}{n_B e \mu_c} = \frac{\mu_b}{\mu_c} = \frac{1}{3}$

45. (B) $\frac{C_D}{A} = \frac{\in}{w} = \frac{11.7 \times 8.85 \times 10^{-12}}{10 \times 10^{-6}} = 10\mu F$

46. (C) $I_E = I_0\left(e^{\frac{v}{vT}} - 1\right)$

V = 0.7, V_T = 26 mV, $I_O = 10^{-13}$ A

I_E = 49mA

47. ()

48. (A)

49. (D)

50. (C) $V_{GS} = 2V, V_T = 1V$
$V_{DS} = 4V; V_{DS} > V_{GS} - V_T$

51. (B) $20 - 0.7 = \frac{430 \times I_E}{51} + I_E$ (I_E is mA)

$I_E = 2.04$ mA

$I_B = \frac{I_E}{1+\beta} = 40\mu A$

$V_C = 20 - 2k \times \alpha \times I_E = 15.9 \approx 16V$

52. (A) $\frac{30 - 5.8}{1000} - 0.5m = 23.7mA$

53. (C) Q_3 is saturation.

$\therefore I_B = \frac{0.75}{1} = 0.75mA$

54. (A) $(C + A)(\overline{A} + \overline{C})B$

55. (C) $9\mu\left(1 - \frac{V_0}{1}\right)^2 = 36\mu\left(1 - \frac{(5 - V_0)}{1}\right)^2$

$1 - V_0 = 2(1 - 5 + V_0)$
$1 - V_0 = -8 + 2V_0$
$9 = 3V_0$
$V_0 = 3$

56. (C) J = 1 K = X Q_n
i.e, J = 1 = 0 = 1
J = 1 = 1 $\overline{Q}_n = 1$

57. (A) +ve edge triggered
$Q_2 Q_1 Q_0$
0 1 1 $\because$ Q_1 and Q_2 are getting 0 as clk pulse
0 1 0

58. (D) A_9 A_8 (A_7 . . . A_0)
(0 1 (X X) → Chip 1
(1 0 X X) Chip 2
Choice (D) doesn't satisfy.

59. (A)

$y(\omega) - x(\omega)\left[\frac{1}{2}e^{-j\omega(t_d - T)} + \frac{1}{2}e^{-j\omega(t_d + T)} + e^{-j\omega t_d}\right]$

$= e^{-j\omega t_d}\left[1 + \cos\omega T\right]$

60. (C)

61. (B) $\frac{Y(\omega)}{X(\omega)} = Ae^{-jn_o\omega_o} = H(\omega) = |H(\omega)|\underline{|H(\omega)}$

$\therefore \underline{|H(\omega)} = -n_o\omega_o + 2\pi k$

periodic with 2π.

62. (B) $x(at) \leftrightarrow \frac{1}{|a|} \times \left(\frac{f}{a}\right)$

$a = \frac{1}{3}$

$\therefore$ only choice satisfying is B.

63. (B) Number of net encirclement should be zero.

64. (C)

65. ()

66. (A) Type 1 system has an error for ramp i/p

$K_v = \lim_{s \to 0} G(s)H(s)$ = zero frequency gain

$= \frac{1}{0.05} = 20$

67. ()

68. (C) The breakaway and break-in points are −1, 3

69. (C) Accumulation mode in n MOS

70. (C) Both fm and Δf get multiplied by 2

BW=2(10+180) = 380

71. (C)

$h(t)=x(T-t)$
$y(t)=R_{xx}(t-T)$

72. (A)

73. ()

74. (C)

$\int_0^4 p(V) = 1 \Rightarrow k = \frac{1}{2}$ $\qquad \frac{k}{4}\frac{4^2}{2} = 1 \quad k = \frac{1}{2}$

$\int_0^4 \frac{k}{4} v dv = 1$

Mean square $= \int_0^4 v^2 p(v) = \frac{k}{4}\int_0^4 V^3 dv = \frac{k}{4}\frac{V^4}{4} = \frac{1}{2 \times 4 \times 4} 4^4 = \frac{4^2}{2} = 8$

75. (D) $\lambda = \frac{2b}{2} = b$

76. (D) $z_0{}^2 = z_{sc} \times z_{oc} \Rightarrow z_{sc} = 7.69 - j11.54\Omega$

77. (B) $z_i = 2M$

$z_o = 20k \parallel 2k = \frac{20}{11}k$

78. ()

79. (A) $I_D = 10\left(1 - \frac{2}{8}\right)^2 = 5.625$

80. (B) $g_m = g_{mo}\left(1 - \frac{V_{DS}}{V_p}\right) = \frac{2 \times 10}{8}\left(1 - \frac{1}{4}\right) = 1.875mS$

$\mu = -g_m\left(r_d \parallel R_D\right) = -3.41$

81. (A) (C)

0100 L×1 SP, 00FF

0103 L×1 H, 0701 H 01

0106 MVI A, 20 L 07

0108 SUB M

A = A – ((H) (L))

= 20 – 20 = 0

(B) (C) 00 or 40 = 40 + 20 = 60

82. (A) ( )

(B) ( )

83. (A) (B) Area of region 1 = $\frac{1}{3}$

$\frac{2a}{4} = \frac{1}{3} \Rightarrow a = \frac{2}{3}$

(B) ( )

84. (A) (B) $\frac{V_{\max}}{V_{\min}} = \frac{4}{1} = \frac{1+|r|}{1-|r|} = \frac{1+|5|}{1-|5|}$

(B) (C)

$|r| = \frac{3}{5} = 0.6$

$r = \frac{z_R - z_O}{z_R + z_O} = 0.6$

$Z_R = 200$

85. (A) (A) shift then scale

(B) (C)

