1. 一個晶體平面時與 x, y, z 軸分別交於 1, 2, 3，其米勒(Miller)指標爲
   (a) [123]　　　(b) [321]　　　(c) [236]　　　(d) [632]　　　(e) [210]

2. 下列哪一個元素無法用歐傑電子分光儀(Auger electron spectroscopy)分析
   (a) 氫　　　(b) 鋰　　　(c) 硼　　　(d) 碳　　　(e) 氧

3. fcc 晶體(111)平面上的 $1/2[1\bar{1}0]$ 全差排(total dislocation)，可分解爲哪兩條部份(partial)差排？
   (a) $1/6[1\bar{2}1], 1/6[2\bar{1}1]$　　　(b) $1/6[1\bar{2}1], 1/6[\bar{2}1\bar{1}]$
   (c) $1/6[\bar{1}2\bar{1}], 1/6[\bar{2}11]$　　　(d) $1/6[121], 1/6[21\bar{1}]$　　　(e) $1/6[1\bar{2}1], 1/6[2\bar{1}\bar{1}]$

4. 承上題，(111)平面上一對 1/6<112> 部份差排交叉滑移(cross slip)到$(11\bar{1})$平面另一對 1/6<112> 部份差排，則留下的梯棒(stair-rod)差排爲
   (a) $1/6[\bar{1}\bar{1}0]$　　　(b) $1/6[1\bar{1}0]$　　　(c) $1/6[1\bar{1}0]$　　　(d) $1/6[110]$　　　(e) $1/6[\bar{1}0\bar{1}]$

5. 假設在 fcc 單晶中，拉伸方向介於[100], [101], $[1\bar{1}1]$之間施以拉伸應力，則沿拉伸方向的晶體方位最後會變成
   (a) $[21\bar{1}]$　　　(b) $[2\bar{1}1]$　　　(c) [211]　　　(d) $[\bar{2}11]$　　　(e) $[1\bar{2}1]$

6. 硫化鐵在鋼鐵熱加工時易造成熱脆(hot short)，主要是因爲硫化鐵
   (a)在晶粒內部形成一長串固體　　　(b)在晶粒內形成液體顆粒　　　(c)在晶界上形成一層液體
   (d)在晶界形成一層氧化層　　　(e)在晶界上形成一長串固體

7. 晶粒成長(grain growth)時，晶粒大小(D)隨時間(t)而變的情形爲
   (a) $D \propto t^{0.5}$　　　(b) $D \propto t^{-0.5}$　　　(c) $D \propto t^{-1}$　　　(d) $D \propto t^{1}$　　　(e) $D \propto t^{-2}$

8. 固定壓力下，三元系統中，平衡時能夠同時存在的相數最多有幾個？
   (a) 2　　　(b) 3　　　(c) 4　　　(d) 5　　　(e) 6

9. When a binary alloy is formed between A and B atoms, there are three bonding energies in the system - ε_{AA}, ε_{BB}, and ε_{AB} representing the bonding energy between A-A atom pair, B-B atom pair, and A-B atom pair, respectively. For the system to segregate or precipitate, the usual conditions is
   (a) $\varepsilon_{AA} > \varepsilon_{AB} > \varepsilon_{BB}$　　　(b) $\varepsilon_{AB} >> (\varepsilon_{AA}+\varepsilon_{BB})/2$　　　(c) $\varepsilon_{AB} << (\varepsilon_{AA}+\varepsilon_{BB})/2$
   (d) $\varepsilon_{AB} < \varepsilon_{AA}+\varepsilon_{BB}$　　　(e) none of the above.

10. In the Kirkendall effect (diffusion couple), which of the following description is wrong.

    (a) The effect confirms that the vacancy mechanisms the major diffusion mechanism for substitutional solid solution

    (b) The region in tension can accompany pore formation

    (c) Element with higher melting temperature usually diffuses faster

    (d) On the side of slower moving species, the region is in compression

    (e) none of the above.

11. The internal friction method is used to measure the interstitials diffusivity. Assume that the stressing frequency is f $(1/f = \tau_p)$ and the mean time of stay for an interstitials is τ_σ. What is the condition for maximum energy loss?

    (a) $f \sim \tau_\sigma$ (b) $\tau_p > \tau_\sigma$ (c) $\tau_p < \tau_\sigma$ (d) $\tau_p \sim \tau_\sigma$ (e) none of the above.

12. For the alloy system being capable of forming metallic glasses, what characteristics does the phase diagram of the system usually have?

    (a) intermetallic compound   (b) high peritetic point   (c) misibility gap

    (d) deep monotetic point   (e) deep eutectic point.

13. Which of the following is not an important factor that determines the lamellar spacing in the case of simple plate-like lamellar eutectic freezing?

    (a) supercooling   (b) surface energy between the lamellar   (c) enthalpy of freezing

    (d) solute diffusivity   (e) none of the above.

14. Which of the following is not the characteristics of the Martensitic transformation?

    (a) reversible characteristic   (b) athermal transformation   (c) rational nature of the habit plane

    (d) complexity of the deformation (Bain distortion, shear deformation, rotation of the transformed lattice)

    (e) none of the above.

15. Which of the following factors is not important in the discussion of nucleation of a new phase from a solid matrix

    (a) surface energy of solid   (b) free energy change in forming the critical embryo

    (c) strain energy   (d) temperature   (e) heterogeneous sites

16. Which of the following description about the Iron-Carbon alloy system is wrong?

 (a) Austenite is FCC Fe   (b) Ferrite is BCC Fe

 (c) Pearlite consists of plates of Fe_3C in the matrix of ferrite

 (d) The growth of pearlite resemble that of the eutectic freezing

 (e) none of the above

17. What are the indications of Davisson-Germer experiment?

 (a) particle nature of electrons   (b) validation of de Broglie relationship

 (c) supplementary evidence of Compton effect   (d) existence of electron spin

 (e) none of the above

18. For a particle of mass m confined in a 3D infinite potential well of dimensional L×L×L, what is the second lowest energy level?

 (a) $h^2/8mL^2$ (b) $h^2/4mL^2$ (c) $3h^2/8mL^2$ **(d) $3h^2/4mL^2$**   (e) none of the above

19. If a light of wavelength λ travels from the Sun to the Earth, the gravity induced wavelength shift is $\Delta\lambda1$. Meanwhile, the Earth is moving away from the Sun, the relative movement induced wavelength shift is $\Delta\lambda2$. Which description is correct?

 (a) $\Delta\lambda1>0$; $\Delta\lambda2>0$ (b) $\Delta\lambda1>0$; $\Delta\lambda2<0$ (c) $\Delta\lambda1<0$; $\Delta\lambda2>0$

 (d) $\Delta\lambda1<0$; $\Delta\lambda2<0$ (e) insufficient information

20. Which statement is **correct**?

 (a) the velocity of a particle decreases after tunneling through a quantum potential barrier

 (b) the mass of a particle decreases after tunneling through a quantum potential barrier

 (c) the energy of a particle decreases after tunneling through a quantum potential barrier

 (d) the amplitude of a particle's wavefunction decreases after tunneling through a quantum potential barrier

 (e) all above are true

21. Assume a hydrogen atom is excited to a quantum state ($n=2$, $l=1$, $m_l=1$, $s=1/2$), what is the angle between the magnetic moment induced by orbital angular momentum μ_l and the applied magnetic field B? (a) 0°   (b) 45°   (c) 90°   (d) 135°   (e) 180°

22. Consider a 2-dimensional harmonic oscillator, what are the 2nd lowest energy level and its degeneracy?

(a) $(3\hbar\omega_0, 3)$ (b) $(3\hbar\omega_0/2, 3)$ (c) $(2\hbar\omega_0, 2)$ (d) $(\hbar\omega_0, 1)$ (e) $(\hbar\omega_0/2, 2)$

ω_0 is the oscillation angular frequency

23. Which statement is **incorrect** for the Bohr model?

(a) the magnitude of orbital angular momentum is assumed to be $\sqrt{l(l+1)}\hbar$

(b) the electron only located at the specific orbital with the radius of $n^2 a_0$ (a_0 is the Bohr radius)

(c) energy levels are proportional to $1/n^2$

(d) the atomic spectra result from the transitions among different energy levels

(e) the nuclear mass will affect the wavelength of atomic spectral lines

24. Which statement is **incorrect**?

(a) The photoelectric effect reveal the particle nature of photon

(b) the Compton scattering confirms the particle nature of photon

(c) pair production occurs in the empty space

(d) the Frank-Hertz experiment demonstrate the existence of discrete energy states of mercury

(e) electron diffraction shows the wave nature of particles

25. There are some particles often mentioned in modern physics such as leptons, mesons, baryons, quarks, ^{4}He, ^{3}He, photons, and Cooper pair. How many of them are fermions?

(a) 1 (b) 2 (c) 3 (d) 4 (e) 5

26. Rotational spectra of molecule are in general in the microwave region. Molecules like H_2O, CO, CO_2, N_2, O_2, O_3, and CH_4 are present in the earth's atmosphere. How many of them may absorb microwave directly and hamper communication?

(a) 0 (b) 1 (c) 2 (d) 3 (e) 4

27. In the following term symbols, which one is a possible expression for the electronic configuration of hydrogen atom either in ground or excited state?

(a) $^2P_{5/2}$ (b) $^0S_{1/2}$ (c) $^1S_{1/2}$ (d) $^2D_1$ (e) $^2P_{3/2}$

28. Consider a system consisting of 3 independent and identical particles. The 1-particle state energy can be described with $E_n = n^2 E_o$; where E_o is the ground state energy ($n=1$). What is the ground state energy of the system when these particles are fermions?

(a) $6 E_o$ (b) $9 E_o$ (c) $14 E_o$ (d) $3 E_o$ (e) E_o

29. Consider a CO_2 gas system. If the system temperature is sufficiently high that all modes of molecular motion are activated, what would be the molar specific heat of CO_2 at constant volume?

(a) $\dfrac{15R}{2}$ (b) $\dfrac{13R}{2}$ (c) $\dfrac{11R}{2}$ (d) $\dfrac{9R}{2}$ (e) $\dfrac{7R}{2}$

30. Due to the spin-orbit coupling, the $2p$ state in the hydrogen atom tends to split into two substates with $\Delta E = 2.3 \times 10^{-5}$ eV apart. The same effect also occurs for $3p$ state of hydrogen atom. What would be the appropriate ΔE for the $3p$ split?

(a) 0.575 (b) 1.15 (c) 3.45 (d) 4.6 (e) 9.2 $\times 10^{-5}$ eV

31. A thermograph measures the rate at which each small portion of person's skin emits infrared radiation. What is the percentage difference between total radiation from skin at 37 °C and 37.5 °C

(a) 0.8%   (b) 0.64%   (c) 0.48%   (d) 0.32%   (e) 0.16%

32. The energy difference between the spin-up and spin-down states of a proton in magnetic field of B = 1 Tesla is about

(a) 0.44   (b) 0.88   **(c) 1.76**   **(d) 3.52**   (e) 7.04 $\times 10^{-7}$ eV

33. The moment of inertia of the shaded area with respect to the x axes is

(a) a^4 (b) $2a^4$ (c) $4a^4$ (d) $8a^4$ (e) none of the above
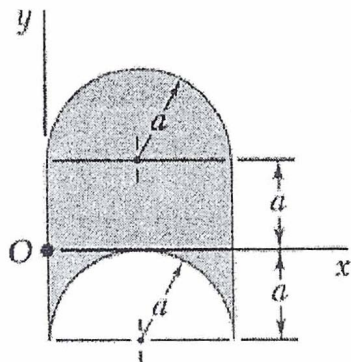
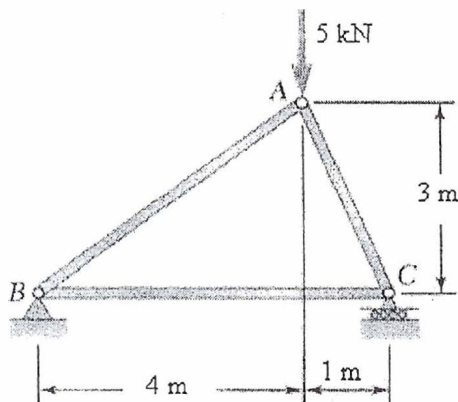34.~35. For the plate subjected to loading as shown.
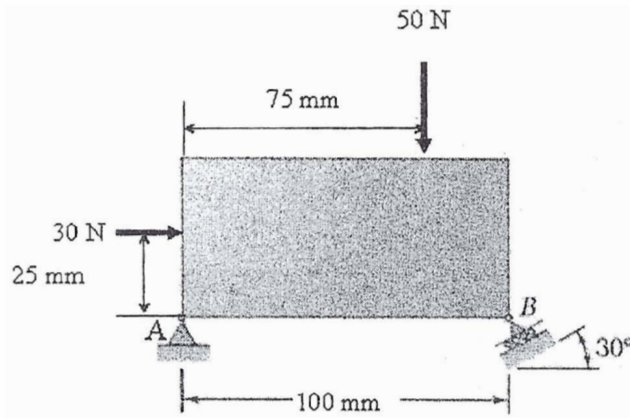
34. The horizontal component of reaction at A is

  (a) $15\sqrt{3} - 30$ (b) $15\sqrt{3} + 30$ (c) $15\sqrt{3} - 15$ (d) $15\sqrt{3} + 15$ (e) none of the above

35. The vertical component of reactions at B is

  (a) 30 N   (b) 35 N   (c) 40 N   (d) 45 N   (e) none of the above

36~37 The truss subjected to the loading as shown.

36. The force in member AB is

  (a) 5/3 kN in tension   (b) 5/3 kN in compression   (c) 4/3 kN in tension

  (d) 4/3 kN in compression   (e) none of the above

37. The force in member AC is

(a) $(5\sqrt{10})/3$ kN in compression
(b) $(5\sqrt{10})/3$ kN in tension
(c) $(2\sqrt{10})/3$ kN in compression
(d) $(2\sqrt{10})/3$ kN in tension
(e) none of the above

38 ~ 39 The cantilever beam subjected a distributed load with the maximum load of $\omega_0 = 20$ kN, a concentrated load of P = 20 kN, and a moment of $M_0 = 20$ kN.m at the tip.
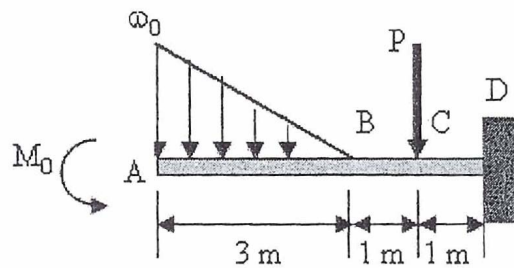
38. The shear force at the support D is

(a) 30 kN (b) 40 kN (c) 50 kN (d) 60 kN (e) none of the above

39. The bending-moment at the support D is

(a) 160 kNm (b) 140 kNm (c) 120 kNm (d) 100 kNm (e) none of the above

40. The moments of inertia of an area A with respect to an axis AA' and the centroid axis BB' are denoted as I and I', respectively. d is the distance between the axes AA' and BB'. The relationship between I, I', A, and d can be expressed as:

(a) $I' = I + Ad^2$ (b) $I' = I - Ad^2$ (c) $I' = I + dA^2$ (d) $I' = I - dA^2$ (e) none of the above
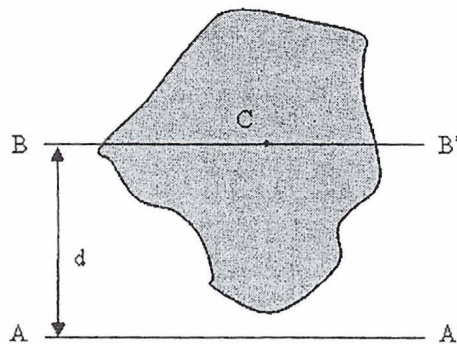
41~42. Consider a stress-strain diagram, as shown, for a typical structural steel in tension.
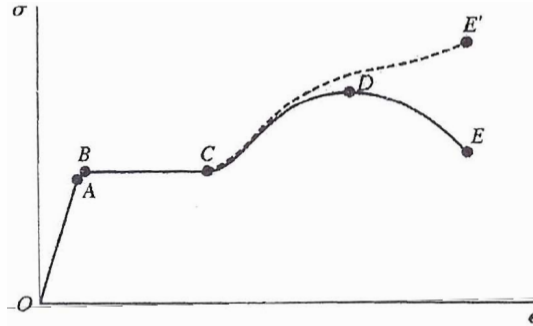
Figure for Problems 41 & 42

41. Which point on the curve indicates the yield stress of this material?

(a) A   (b) B   (c) C   (d) D   (e) E

42. Which segment on the curve indicates the strain hardening of this material?

(a) OA   (b) AB   (c) BC   (d) CD   (e) DE

43~44. Consider a solid steel shaft ABCDE as shown, which is in equilibrium and is driven by torques T_1, T_2 and T_3.
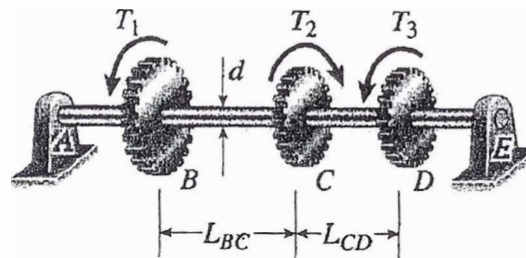
Figure for Problems 43 & 44

43. Which of the following equilibrium equation is correct?

(a) $T_1+T_2=T_3$ (b) $T_2+T_3=T_1$ (c) $T_1+T_3=T_2$ (d) $T_1-T_3=T_2$ (e) $T_1-T_2=T_3$

44. Which of the following equation is correct (ϕ_{BC}: angle of twist, τ_{BC}: shear stress, T_{BC}: torque in segment BC; G: shear modulus; I_p: polar moment of inertia)?

(a) $\phi_{BC}=\dfrac{T_{BC}}{GI_p}$ (b) $\phi_{BC}=\dfrac{T_{BC}L_{BC}}{G}$ (c) $\phi_{BC}=\dfrac{T_{BC}L_{BC}}{GI_p}$

(d) $\tau_{BC}=\dfrac{T_{BC}}{GI_p}$ (e) $\tau_{BC}=\dfrac{T_{BC}}{G}$

45~46 At a point on the surface of a generator shaft, the stresses are σ_x = -50 MPa, σ_y =10 MPa, τ_{xy} = -40 MPa as shown.
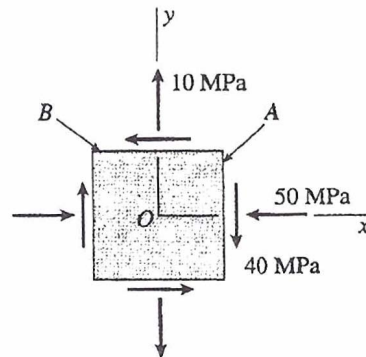
Figure for Problems 45 & 46

45. The radius of Mohr's circle is

   (a) 20 MPa   (b) 30 MPa   (c) 40 MPa   (d) 50 MPa   (e) 60 MPa.

46. The center of Mohr's circle on $\sigma_x - \tau_{xy}$ plane is at

   (a) (-20 MPa, 0 MPa)   (b) (0 MPa, 0 MPa)   (c) (20 MPa, 0 MPa)
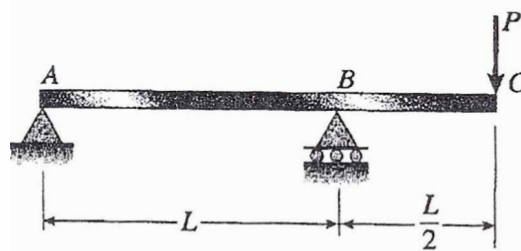   (d) (-20 MPa, -20 MPa)   (e) (20 MPa, 20 MPa)

47~48. Consider a beam problem as shown

Figure for Problems 47 & 48

47. The shear force in section L<x<1.5L is

   (a) 0.5P   (b) P   (c) 1.5P   (d) 2P   (e) 2.5P

48. Which of the following boundary conditions is wrong?

   (a) $v(0) = 0$ (b) $v(L) = 0$ (c) $v''(0) = 0$ (d) $v''(L) = 0$ (e) $v''(1.5L) = 0$

   (Note: v'' denotes the second derivative of v with respect to x.)

For the problems from 49 to 56, choose the one alternative that best completes the statement or answers the question.

49. Which of the following is the strongest acid ?

(a)CH_3OH　(b) $CH_3OH_2^+$　(c) H_2N^-　(d) CH_3NH_2　(e) $CH_3NH_3^+$

50. The pKa of CH_3COOH is 4.8. If the pH of an aqueous solution of CH_3COOH and CH_3COO^- is 4.8, then one knows _____

(a)CH_3COOH is completely ionized　　(b) $[CH_3COOH] > [CH_3COO^-]$

(c)$[CH_3COOH] = [CH_3COO^-]$　　(d) $[CH_3COOH] < [CH_3COO^-]$

(e)CH_3COOH is completely unionized

51. Which of the following describes the most stable conformation of trans-1-tert-butyl-3-methylcyclohexane?
(a) Both groups are equatorial　(b) Both groups are axial　(c) The tert-butyl group is equatorial
(d) The tert-butyl group is axial and the methyl group is equatorial　(e) None of the above

52. Which of the following correctly describes the reaction shown ?

$CH_2=CH_2$ + HBr → CH_3CH_2Br + heat

(a) $\Delta H^o > 0$ and $\Delta S^o > 0$　　(b) $\Delta H^o > 0$ and $\Delta S^o < 0$　　(c) $\Delta H^o < 0$ and $\Delta S^o > 0$
(d) $\Delta H^o < 0$ and $\Delta S^o < 0$　　(e) $\Delta H^o = \Delta S^o = 0$

53. According to the Hammond Postulate, which of the following is correct ?
(a) The transition state of an endothermic reaction step will be more reactant-like than product-like
(b) The intermediate of an endothermic reaction step will be more reactant-like than product-like
(c) The transition state of an exothermic reaction step will be more reactant-like than product-like
(d) All transition states are more product-like than reactant-like
(e) None of the above

54. Which of the following is the best reaction sequence to use if one wants to accomplish a Markovnikov addition of water to an alkene with minimal skeletal rearrangement ?
(a) water + dilute acid　　(b) water + concentrated acid　(c) oxymercuration –demercuration
(d) hydroboration-oxidation　(e) none of the above

55. What is the relationship between the structures shown below ?

and

(a) enantiomers   (b) diastereomers   (c) configurational isomers

(d) identical compounds   (e) constitutional isomers

56. Which of the following dienes is the most reactive in a Diels-Alder reaction ?
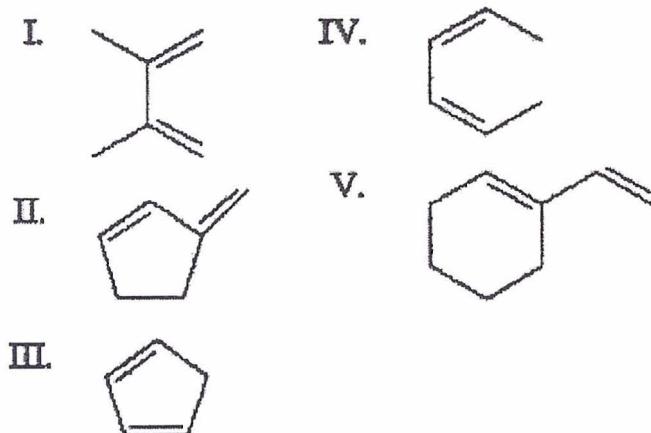
(a) I   (b) II   (c) III   (d) IV   (e) V

57. Each of the following compounds has a singlet in its ^1H NMR spectrum. Which compound would have its singlet at the highest frequency (farthest downfield)?

(a) ethyl methyl ether

(b) 1,2-dibromoethane

(c) 2-ethoxy-2-methylbutane

(d) 1-bromo-2,2-dimethylpropane

(e) ethyl-tert-butyl ether

58. Which of the following compounds can result in a disulfide bond?

   (a) benzenesulfonic acid
   (b) adipic acid
   (c) methionine
   (d) cysteine
   (e) tyrosine

59. What is the repeating unit if $CF_2=CH_2$ polymerizes under radical conditions? Assume only head-to-tail addition occurs.

   (a) $-CH_2CH_2CF_2CF_2-$
   (b) $-CH_2CF_2CH_2-$
   (c) $-CF_2CF_2-$
   (d) $-CF_2CH_2-$
   (e) $-CH_2CH_2-$

60. Which of the following shows the correct relative reactivitites?

   (a) acyl chloride > acid anhydride > carboxylic acid > ester > amide
   (b) acyl chloride > ester > carboxylic acid > amide > acid anhydride
   (c) acyl chloride > acid anhydride > ester > carboxylic acid > amide
   (d) acid anhydride > carboxylic acid > amide > ester > acyl chloride
   (e) acyl chloride > carboxylic acid > amide > acid anhydride > ester

61. Which of the following cannot be reduced by catalytic hydrogenation?

   (a) an imine
   (b) a nitrile
   (c) an aldehyde
   (d) a ketone
   (e) an amide

62. Which of the following reagents will convert 2-methyl-2-butene to one equivalent acetone and one equivalent of acetaldehyde?

    (a) $KMnO_4$, H^+
    (b) $KMnO_4$, HO^-, heat
    (c) a peroxyacid
    (d) (1) O_3 (2) $(CH_3)_2S$
    (e) HIO_4

63. Which of the following bonds will show an absorption band at the greatest wavenumber?

    (a) C=O
    (b) O-H
    (c) C-O
    (d) C-D
    (e) C=C

64. Which of the following molecules is **not** aromatic?

    (a) cyclopentadiene

    (b) cycloheptatrienyl cation

    (c) furan

    (d) pyrrole

    (e) thiophene

65. Find the value of the equivalent conductance, L_{eq}, that can replace the series-parallel connection of conductance shown below.

(a) 0.2 H   (b) 0.24 H   (c) 0.3 H   (d) 0.6 H   (e) 1 H
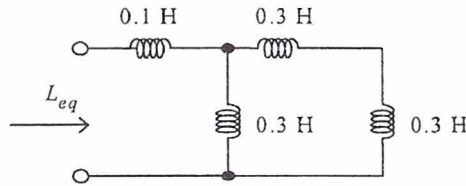
66. Find the equivalent capacitance of the combination shown below, assuming $C_1 = 10$ μF, $C_2 = 10$ μF, and $C_3 = 20$ μF.

(a) 40 μF   (b) 30 μF   (c) 20 μF   (d) 10 μF   (e) 25 μF
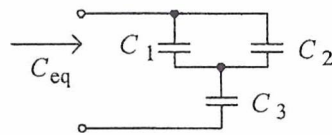
67. Find the values of current i_s and voltage v_x for the circuit below.

(a) 1.6 A, 24 V   (b) 2 A, 16 V   (c) 1 A, 36 V   (d) 0.8 A, 40 V   (e) 0.8 A, 32 V
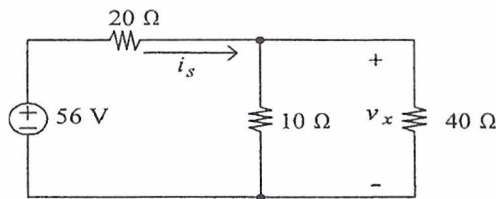
68. Find the Thevenin equivalent circuit for the circuit below.

(a) 1.51 Ω 1.35 V
(b) 1.35 V 1.51 Ω
(c) 1.67 Ω 1.25 V
(d) 1.25 V 1.67 Ω
(e) 10 Ω 1.875 V
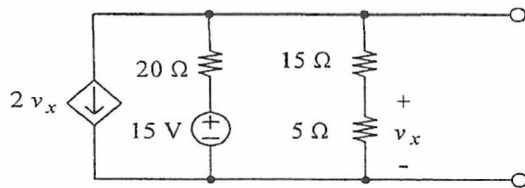
69. Find the voltage v_c in steady state for the circuit shown in Fig. 69-70.

(a) -2200 cos(100t) (b) -2200 (c) 2200sin(100t) (d) 20 sin(100t) (e) 0
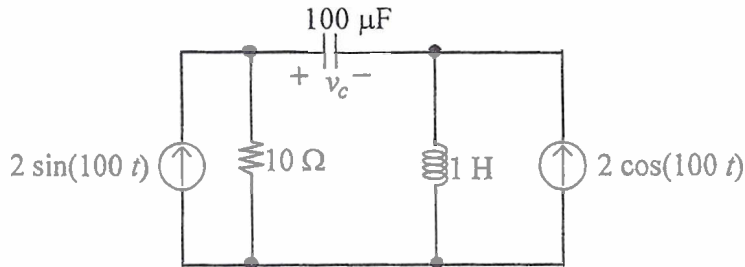
Fig. 69-70

70. Consider the circuit of Fig. 69-70. What is the power taken from the left current source 2 sin(100t)?

(a) 200 W (b) 40 W (c) -40 W (d) 2200 W (e) -200 W

71. The transfer function $H(f) = V_{out}/V_{in}$ of a filter is shown below. The input signal is given by

$v_{in} = 2 + 2\sin(1000\pi t + 20°)$. What is the steady-state output of the filter?

(a) $2 + 4\sin(1000\pi t - 25°)$ (b) $2 + 4\sin(1000\pi t - 70°)$ (c) $4\sin(1000\pi t - 70°)$ (d) $3\cos(1000\pi t - 115°)$ (e) $2 + 3\cos(1000\pi t - 115°)$
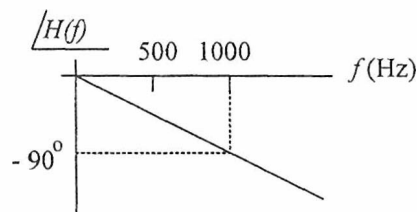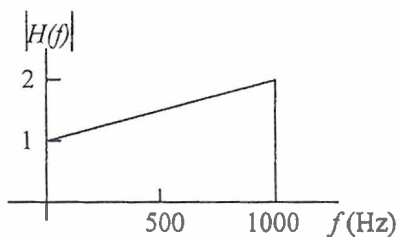
72. Suppose that we want a first-order highpass filter that has a transfer-function magnitude of -20 dB at $f = 60$ Hz. What is the break frequency for this filter?

(a) 6 Hz (b) 600 Hz (c) 1200 Hz (d) 2400 Hz (e) 6000 Hz

73. For the following truth table, use Sum-of-Product (SOP) to express logic function of output (D) Logic 1, and Karnaugh map to simplify. Which one below best prepresents D logic function?
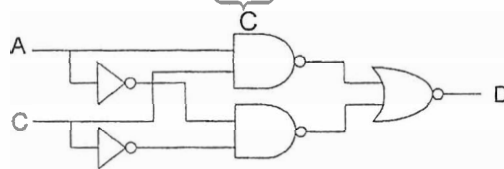
A	B	C	D
0	0	0	1
1	0	0	0
0	1	0	1
0	0	1	0
1	1	0	0
1	0	1	1
0	1	1	0
1	1	1	1

(a) The logic function of $D = \overline{A}\,\overline{B}\,\overline{C} + \overline{A}\,B\,\overline{C} + A\,\overline{B}\,C + A\,B\,C$

(b) The Karnaugh map of D can be
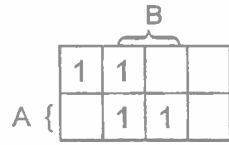
(c) The logic circuits of D can be

(d) The minimum Sum-of-Products (SOP) expression for D, $D = \overline{A}\,\overline{B} + A\,C$

(e) All above are incorrect

74. For a positive-edge-triggered D-flip flop, which one best represents the Q waveform?
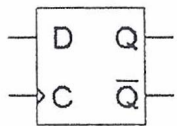
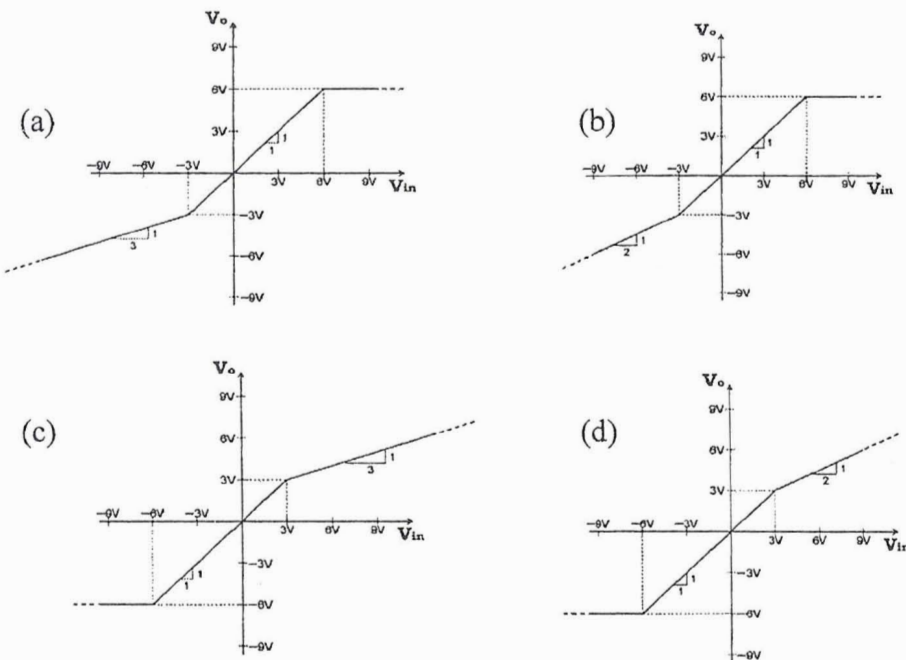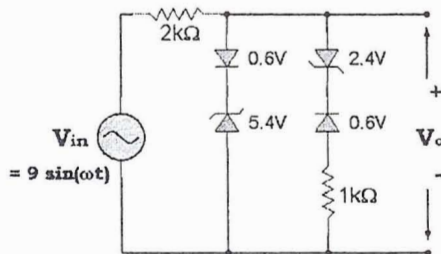| C	D	Qn
0	X	Q_{n-1}
1	X	Q_{n-1}
↑	0	0
↑	1	1

(a) Q

(b) Q

(c) Q

(d) Q

(e) Q
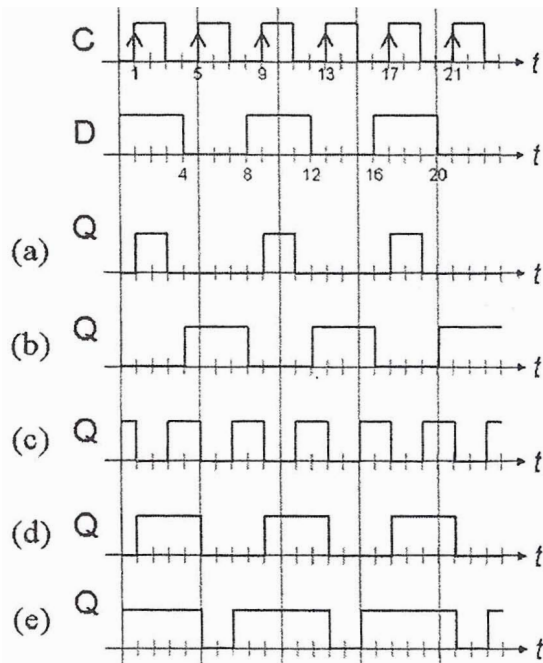
75. Which one below is most likely to be correct based on the attached circuit?
    Assume diodes D1 and D2 are all ideal diodes.

    (a) V = 30 V, I_1 = 10 mA, I_2 = 25 mA
    (b) V = -5 V, I_1 = 2.5 mA, I_2 = 0 mA
    (c) V = 15 V, I_1 = 10 mA, I_2 = 25 mA
    (d) V = 10 V, I_1 = 10 mA, I_2 = 15 mA
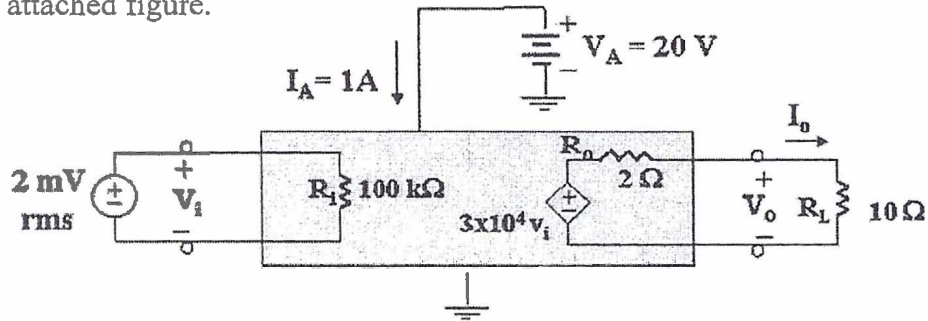   (e) All above are incorrect
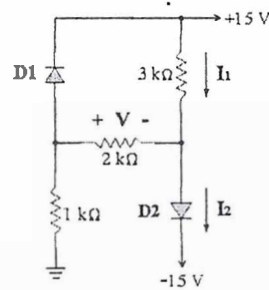
76. Which transfer characteristic below best represents the circuit below?
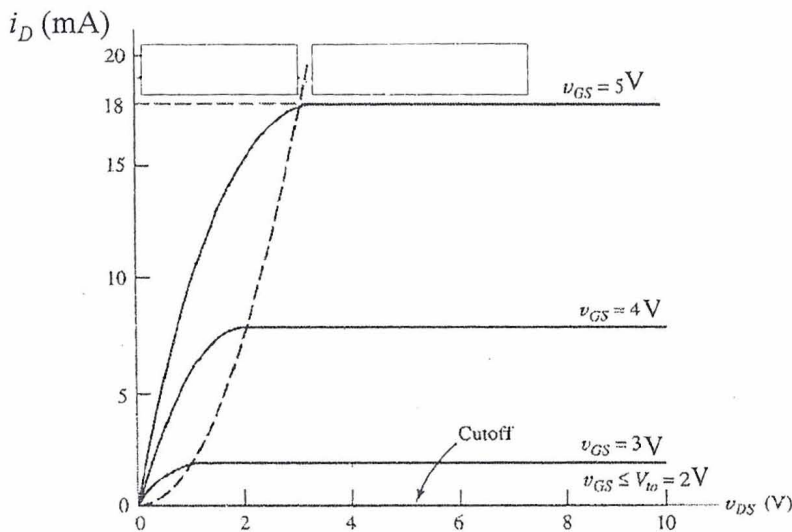

(a)

(b)

(c)

(d)

(e) All above are incorrect

77. Which value below is closest to that of the power efficiency (P_0/P_s) for the amplifier as the following attached figure.
   (a) 60%
   (b) 50%
   (c) 40%
   (d) 30%
   (e) 20%

78. Based on the following plot, which statement is **incorrect**?

   (a) This plot shows a normally-off NMOS transistor i_D - v_{DS} characteristics
   (b) The boundary between triode region and saturation region is at v_{GS} - $v_{DS} = V_{t0}$
   (c) The device is at triode region for $v_{GS} \geqq V_{t0}$ and $0 \leqq v_{DS} \leqq v_{GS} - V_{t0}$
   (d) At saturation region, $i_D = K(v_{GS} - V_{t0})^2$, K is device constant
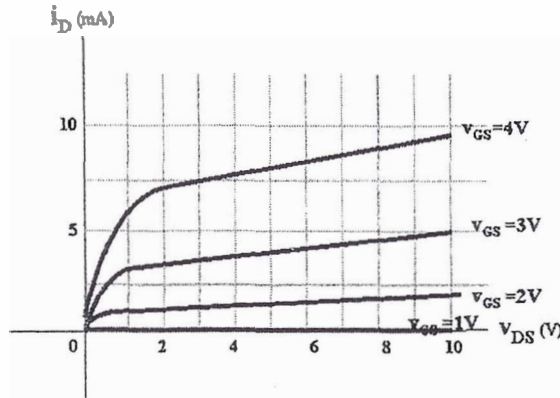   (e) For $v_{DS} = 3$ V, $v_{GS} = 1$ V, the device is at saturation region

79. Which one below is closest to the transconductance (g_m) value at the operation point defined by $V_{DSQ} = 5$ V and $V_{GSQ} = 3$ V based on the following device characteristics?

(a) $g_m = 5.0$ mS
(b) $g_m = 0.3$ mS
(c) $g_m = 1.1$ mS
(d) $g_m = 0.8$ mS
(e) $g_m = 3.0$ mS

80. Which statement is most likely correct for the following circuit? Assume $|V_{BE}| = 0.7$ V in both the active and saturation regions for all the transistors.

(a) For $\beta = 100$, $V_{CE} = 0.2$ V
(b) For $\beta = 100$, $V_{CE} = 10$ V
(c) For $\beta = 100$, $V_{CE} = 5.35$ V
(d) For $\beta = 300$, it is at active region
(e) For $\beta = 300$, it is at saturation region