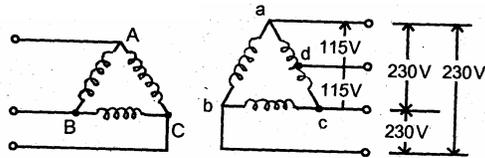


ELECTRICAL ENGINEERING

PAPER-II

1. The diagram given below shows the connection of a four-wire delta bank for obtaining a 3-phase 4-wire distribution system. The secondary voltages between the terminals are as indicated, a



What is the voltage between the terminals b and d in the above system when the primary side is energized from an appropriate symmetrical 3-phase system?

- $230 / \sqrt{2}$ V
 - $230 / \sqrt{3}$ V
 - $115 \times \sqrt{3}$ V
 - $115 \times \sqrt{2}$ V
2. If per unit impedances of two transformers connected in parallel are not equal, then which one of the following statements is correct?
- The power factor of the two transformers will be different from that of the connected load
 - Transformers will get overloaded
 - Dead short circuit occurs
 - The transformer with higher per unit impedance will share more load
3. Match List I (Machine) with List II (Performance) and select the correct answer using the codes given below :
- List I**
- Three phase induction motor
 - Synchronous motor
 - D. C. series motor
 - D. C. shunt motor
- List II**
- Adjustable speed
 - High starting torque
 - Not self-starting
4. Self-starting
- | | A | B | C | D |
|----|---|---|---|---|
| a. | 3 | 4 | 1 | 2 |
| b. | 4 | 3 | 1 | 2 |
| c. | 3 | 4 | 2 | 1 |
| d. | 4 | 3 | 2 | 1 |
4. In a d.c. machine, for the same values of ϕ , Z and N; which one of the following statements is correct ?
- Armature e.m.f. is more with wave winding than with lap winding
 - Armature e.m.f. is less with wave winding than with lap winding
 - Armature e.m.f. depends on whether the machine is running as a motor or a generator
 - Armature e.m.f. is the same as long as the flux density in the air gap remains the same
5. Match List I (Constructional Components) with List II (Machines) and select the correct answer using the codes given below :
- List I**
- Damper bars
 - Equalizer rings
 - Skewed slots
 - Water-cooling ducts
- List II**
- Cylindrical – rotor synchronous generator
 - Salient pole synchronous motor
 - Squirrel-cage induction motor
 - Direct current generator
- | | A | B | C | D |
|----|---|---|---|---|
| a. | 2 | 4 | 3 | 1 |
| b. | 1 | 3 | 4 | 2 |
| c. | 1 | 4 | 3 | 2 |
| d. | 2 | 3 | 4 | 1 |
6. A d.c. shunt motor is excited from an alternating power frequency voltage

source. Its brush-axis is rotated by an angle α from the geometrical neutral axis. The torque developed will be proportional to which one of the following?

- $\sin \alpha$
- $\cos \alpha$
- $\tan \alpha$
- $\cos 2\alpha$

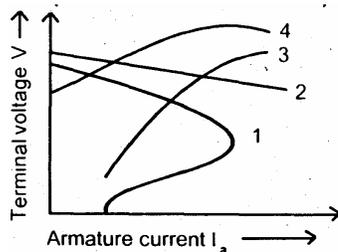
7. Four types of d.c. generators of constant speed are considered (List I). Their external characteristics at constant speed are given in List II. Match List I (Type of d.c. generator) with List II (External characteristics) and select the correct answer using the codes given below :

List I (Type of d.c. generator)

- Separately excited
- Series excited
- Shunt excited
- Over-compound excited

List II (External characteristics)

1.



- | | A | B | C | D |
|----|---|---|---|---|
| a. | 2 | 3 | 1 | 4 |
| b. | 1 | 4 | 2 | 3 |
| c. | 1 | 3 | 2 | 4 |
| d. | 2 | 4 | 1 | 3 |

8. Consider the following statements: The speed of a d.c. motor can be controlled by the variation of

- armature voltage
- field current
- armature circuit resistance
- angle of brush shift

Which of the statements given above are correct ?

- 1, 2 and 3
- 2, 3 and 4
- 1, 3 and 4
- 1, 2 and 4

9. What is the increase in the torque expressed as percentage of initial torque, if the current drawn by a d.c. motor is increased from 10 A to 12 A (Neglect saturation)?

- 21%
- 25%
- 41%
- 44%

10. Consider the following statements

In a d.c. machine, iron loss occurs in

- armature core
- yoke
- pole cores
- pole shoes

Which of the statements given above are correct?

- 1 and 4
- 1 and 2
- 1 and 3
- 2 and 3

11. Four important parameters of alternators have comparatively larger or smaller values. In comparison to a steam turbine driven alternator, a hydraulically driven machine will have which one of the following combinations?

| Number of armature conductors | Axial length of armature conductors | Number of poles | Operating speed |
|-------------------------------|-------------------------------------|-----------------|-----------------|
|-------------------------------|-------------------------------------|-----------------|-----------------|

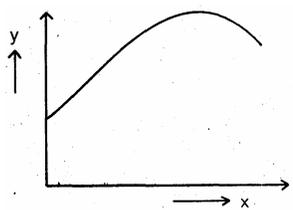
- Smaller larger smaller higher
- Larger smaller larger lower
- Larger larger smaller lower
- Smaller smaller larger higher

12. Which one of the following is the primary reason for placing field on rotor in an alternator?

- Small power in field circuit
- Insulation of high voltage is made easy on stator than on rotor
- Large power in stator
- Large current in the stator

13. Consider the following:

- Supply voltage
- Excitation current
- Maximum value of load angle

- The maximum power developed by a synchronous motor is a function of which of the above?
- 1 and 2
 - 1 and 3
 - 2 and 3
 - 1, 2 and 3
14. When a 3-phase alternator is suddenly short-circuited at its terminals, the initial value of the short-circuit current is limited by which one of the following ?
- Subtransient reactance x''_d
 - Transient reactance x'_d
 - Synchronous reactance x_s
 - Sum of x''_d , x'_d and x_s
15. Which one of the following methods gives more accurate result for determination of voltage regulation of an alternator?
- m.m.f. method
 - Synchronous impedance method
 - Potier triangle method
 - American Institution Standard method
16. Which one of the following statements is correct?
- In a salient pole synchronous machine the air gap is
- uniform under the whole pole shoe
 - least under the middle of the pole shoe and increases outwards
 - largest under the middle of the pole shoe and decreases outwards
 - least at one end of the pole shoe and increases to the maximum Value at the other end
17. Which one of the following is not a necessary condition to be satisfied for synchronising an incoming alternator to an already operating alternator?
- Same voltage magnitude
 - Same frequency
 - Same prime mover speed
 - Same phase sequence
18. Which one of the following statements is correct?
- A smaller air gap in a polyphase induction motor helps to
- reduce the chances of crawling
 - increase the starting torque
 - reduce the chance of cogging
 - reduce the magnetizing current
19. Which one of the following statements is correct?
- In an induction motor, if the air gap is increased,
- its speed will reduce
 - its efficiency will improve
 - its power factor will reduce its breakdown torque will reduce
20. Which one of the following statements is correct?
- In a 3-phase induction motor, the torque developed is maximum when the rotor circuit resistance per phase is equal to
- rotor leakage reactance per phase at standstill
 - slip times the rotor leakage reactance per phase at standstill
 - stator resistance per phase
 - stator leakage reactance per phase
21. The supply voltage to an induction motor is reduced by 10%. By what percentage, approximately, will the maximum torque decrease?
- 5%
 - 10%
 - 20%
 - 40%
22. Consider the following curve
- 
- Which of the following characteristics of the induction represented by the above curve?
- | <u>x—axis</u> | <u>y—axis</u> |
|---------------|---------------|
| a. Output | p.f. |
| b. Speed | p.f. |
| c. Load | efficiency |
| d. Speed | torque |
23. A squirrel-cage induction motor having a rated slip of 4% on full load has a starting torque same as the full load torque. Which one of the following statements is correct?

- The starting current is
- equal to the full load current
 - twice the full load current
 - four times the full load current
 - five times the full load current
24. Which one of the following types of motors is most suitable for a computer printer drive?
- Reluctance motor
 - Hysteresis motor
 - Shaded pole motor
 - Stepper motor
25. For a reluctance type motor, if the stator magnetic field angular velocity is ω and the actual rotor angular velocity is ω_r , and then which one of the following equations is satisfied if the average electromagnetic torque is not zero ?
- $\omega = \omega_r / 2$
 - $\omega = \omega_r$
 - $\omega = 2\omega_r$
 - $\omega = 4\omega_r$
26. Which one of the following statements is correct?
- When a single phase induction motor is excited with single phase a.c. voltage, the magnetic field set up is equivalent to
- two fields, rotating in opposite directions with different speeds
 - two fields, rotating at synchronous speed in opposite directions
 - two fields, rotating at synchronous speed
 - two fields rotating in the same direction but at different speeds
27. Consider the following statements regarding pumped storage plants :
- A pumped storage plant is a base load plant.
 - The starting time of a pumped storage plant is very short
 - Reversible turbines and pumps are highly suitable for pumped storage plants
- Which of the statements given above are correct?
- 1 and 2
 - 1 and 3
 - 2 and 3
 - 1, 2 and 3
28. Which one of the following equations is correct?
- $-AB + CD = -1$
 - $AD + CB = 1$
 - $AB - CD = -1$
 - $-AD + BC = -1$
- where A, B,C and D are generalized circuit constants.
29. Match List I (Name of Power Plant) with List II (Plant Features) and select the correct answer using the codes given below:
- List I**
- Thermal
 - Nuclear
 - Hydro
 - Diesel
- List II**
- High operating cost
 - High capital cost
 - High plant life
 - High fuel transportation cost
- | | A | B | C | D |
|----|---|---|---|---|
| a. | 3 | 1 | 4 | 2 |
| b. | 4 | 2 | 3 | 1 |
| c. | 3 | 2 | 4 | 1 |
| d. | 4 | 1 | 3 | 2 |
30. The combined effect of series and shunt compensation on transmission lines in terms of degree of series compensation (K_{se}), degree of shunt compensation (K_{sh}), and surge impedance of uncompensated line (Z_0) is given by which one of the following equations ?
- $Z'_0 = Z_0 \sqrt{1 - K_{se}} \cdot \sqrt{1 - K_{sh}}$
 - $Z'_0 = \left[\sqrt{1 - K_{se}} \cdot \sqrt{1 - K_{sh}} \right] / Z_0$
 - $Z'_0 = Z_0 \sqrt{(1 - K_{se}) / (1 - K_{sh})}$
 - $Z'_0 = Z_0 \sqrt{(1 - K_{sh}) / (1 - K_{se})}$
31. Match List I (Classification based on Head) with List II (Type of Turbine) and select the correct answer using the codes given below :
- List I**

- A. Low head, 2–15 m
- B. Medium head, 16–70 m
- C. High head, 71–500 m
- D. Very high head, > 500 m

List II

- 1. Pelton
- 2. Francis or Pelton
- 3. Kaplan or Francis
- 4. Propeller or Kaplan

| | A | B | C | D |
|----|---|---|---|---|
| a. | 4 | 3 | 2 | 1 |
| b. | 3 | 4 | 1 | 2 |
| c. | 4 | 3 | 1 | 2 |
| d. | 3 | 4 | 2 | 1 |

32. D_s is the GMR of each subconductor of a four subconductor bundle conductor and d is the bundle spacing. What is the GMR of equivalent single conductor?

- a. $1.09 \sqrt{D_s \times d^3}$
- b. $1.09 \sqrt{D_s^3 \times d^3}$
- c. $1.09 \sqrt[4]{D_s^3 \times d^3}$
- d. $1.09 \sqrt[4]{D_s \times d^3}$

33. Which one of the following statements is correct?

Corona loss increases with

- a. decrease in conductor size and increase in supply frequency
- b. increase in both conductor size and supply frequency
- c. decrease in both conductor size and supply frequency
- d. increase in conductor size & decrease in supply frequency

34. For a fixed receiving end and sending end voltage in a transmission system, what is the locus of the constant power?

- a. A straight line
- b. An ellipse
- c. A parabola
- d. A circle

35. At slack bus, which one of the following combinations of variables is specified ?

- a. $|V|, \delta$
- b. P,Q
- c. P, $|V|$

- d. $Q, |V|$

(The symbols have their usual meaning)

36. Consider the following quantities :

- 1. Real power
- 2. Reactive power
- 3. Power factor
- 4. Input current
- 5. Bus voltage magnitude
- 6. Bus voltage phase–angle

For the purpose of the load flow studies of a power system, each bus or node is associated with which one of the combinations of the above four quantities?

- a. 1, 3, 4 and 5
- b. 1, 2, 3 and 4
- c. 2, 3, 5 and 6
- d. 1, 2, 5 and 6

37. Consider the following statements regarding load frequency control :

- 1. Time constant of automatic load frequency control is about 15 seconds.
- 2. Integral control eliminates static frequency drop.
- 3. In tie-line load bias control, the control signal for each area is proportional to change in frequency as well as change in tie-line power.

Which of the statements given above are correct?

- a. 1, 2 and 3
- b. 1 and 2
- c. 1 and 3
- d. 2 and 3

38. Which one of the following statements is correct?

Normally Z_{BUS} matrix is a

- a. Null matrix
- b. Sparse matrix
- c. Full matrix
- d. Unity matrix

39. If $\alpha = e = e^{j\frac{2\pi}{3}}$, and $I = AI_s$ where I is equal to phase current vector and I_s is equal to symmetrical current vector, then which one of the following matrices is the symmetrical components transformation matrix A ?

a.
$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & \alpha & \alpha^2 \\ 1 & \alpha^2 & \alpha \end{bmatrix}$$

b.
$$\begin{bmatrix} 1 & \alpha & \alpha^2 \\ 1 & 1 & 1 \\ 1 & \alpha^2 & \alpha \end{bmatrix}$$

c.
$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & \alpha^2 & \alpha \\ 1 & \alpha & \alpha^2 \end{bmatrix}$$

d.
$$\begin{bmatrix} 1 & \alpha^2 & \alpha \\ 1 & \alpha & \alpha^2 \\ 1 & 1 & \alpha \end{bmatrix}$$

40. Z_{pu}^{old} is the per unit impedance on the power base S_B^{old} and voltage base V_B^{old} what would be the per unit impedance on the new power base S_B^{new} and voltage base V_B^{new} ?

a.
$$Z_{pu}^{new} = Z_{pu}^{old} \frac{S_B^{old}}{S_B^{new}} \left(\frac{V_B^{new}}{V_B^{old}} \right)^2$$

b.
$$Z_{pu}^{new} = Z_{pu}^{old} \frac{S_B^{new}}{S_B^{old}} \left(\frac{V_B^{old}}{V_B^{new}} \right)^2$$

c.
$$Z_{pu}^{new} = Z_{pu}^{old} \frac{S_B^{new}}{S_B^{old}} \left(\frac{V_B^{old}}{V_B^{new}} \right)$$

d.
$$Z_{pu}^{new} = Z_{pu}^{old} \frac{S_B^{old}}{S_B^{new}} \left(\frac{V_B^{new}}{V_B^{old}} \right)$$

41. Consider the following statements regarding the fault analysis :
1. The neutral grounding impedance Z appears as $3 Z_n$, in zero sequence equivalent circuit.
 2. For faults on transmission lines, 3-phase faults the least severe amongst other faults.
 3. The positive and negative sequence networks are not affected by method of neutral grounding.

Which of the statements given above are correct?

- a. 2 and 3
- b. 1 and 2
- c. 1 and 3
- d. 1, 2 and 3

42. Consider the following statements :

Stability studies constitute

1. the major analytical approach V to the study of power system electromechanical dynamic behaviour.
2. the involvement of one or just a few machines undergoing slow or gradual changes in operating conditions.
3. the determination of the locus of essentially steady-state operating points of the system.
4. the determination of whether or not the rotors of the machines being perturbed, return to the constant speed operation.

Which of the statements given above are correct?

- a. 1, 2 and 3
- b. 2, 3 and 4
- c. 1 and 4
- d. 1, 2, 3 and 4

43. If a sudden short circuit occurs on a power system (considered as RL series circuit), the current wave-form consists of

1. a decaying a.c. current.
2. a decaying d.c. current.

Let the alternator reactance be X and the power system resistance R . Which one of the following is correct ?

- a. The decay in (1) is caused by the increase in X but in (2) is caused by R
- b. The decay in (1) is caused by R but in (2) is caused by increase in X
- c. The decay in both (1) and (2) is caused by R
- d. The decay in both (1) and (2) is caused by the increase in X

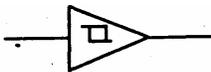
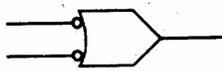
44. Match List I (Type of Relays) with List II (Types of Protection) and select the correct answer using the codes given below:

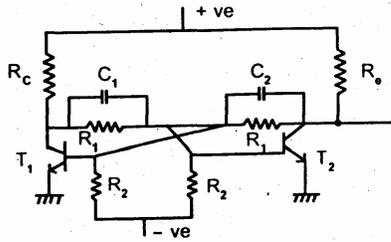
List I

- A. Directional relay
- B. Impedance relay
- C. Differential relay
- D. Pilot relay

List II

1. Relay operates for fault within certain distance of its location
2. Relay will trip for fault in one location and block for all other locations

3. High speed protection for entire transmission line
4. The principle of current continuity is used to devise a simple and effective relaying system over a small physical space
- | | A | B | C | D |
|----|---|---|---|---|
| a. | 1 | 2 | 4 | 3 |
| b. | 2 | 1 | 3 | 4 |
| c. | 2 | 1 | 4 | 3 |
| d. | 1 | 2 | 3 | 4 |
45. Consider the following statements regarding the suitable choice of HVDC converter configuration:
- Pulse number should be high.
 - Ratio of peak inverse voltage to no load d.c. output voltage should be as high as possible.
 - Transformer utilization factor should be nearly unity.
- Which of the statements given above are correct?
- 1 and 2
 - 1, 2 and 3
 - 2 and 3
 - 1 and 3
46. Two identical RC coupled amplifiers, each having an upper cut-off frequency f_u , are cascaded with negligible loading. What is the upper cut-off frequency of the overall amplifier?
- $\frac{f_u}{\sqrt{\sqrt{2}-1}}$
 - $f_u \sqrt{\sqrt{2}-1}$
 - $f_u / 2$
 - $2f_u$
47. Two identical RC coupled amplifiers, each having a lower cut-off frequency f_l are cascaded with negligible loading. What is the lower cut-off frequency of the overall amplifier?
- $\frac{f_l}{\sqrt{\sqrt{2}-1}}$
 - $f_l \sqrt{\sqrt{2}-1}$
 - $f_l / 2$
 - $2f_l$
48. A synchronous sequential circuit is designed to detect a bit sequence 0101 (overlapping sequence included). Every time this sequence is detected, the circuit produces an output of '1'. What is the minimum number of states the circuit must have ?
- 4
 - 5
 - 6
 - 7
49. Match List I (Circuit Symbols) with List II (Nomenclature) and select the correct answer using the codes given below :
- List I**
- A. 
- B. 
- C. 
- D. 
- List II**
- NAND
 - NOR
 - Buffer
 - Schmitt trigger
- | | A | B | C | D |
|----|---|---|---|---|
| a. | 4 | 3 | 1 | 2 |
| b. | 3 | 4 | 2 | 1 |
| c. | 4 | 3 | 2 | 1 |
| d. | 3 | 4 | 1 | 2 |
50. If x and y are Boolean variables, which one of the following is the equivalent of $x \oplus y \oplus xy$?
- $x + \bar{y}$
 - $x + y$
 - 0
 - 1
51. Consider the following bistable multivibrator circuit:



Which one of the following statements is correct ?

In the above circuit, condensers C_1 and C_2 are used

- for passing the noise
- to compensate The collector-emitter capacitance
- to speed up the switching action
- to provide negative feedback path

52. Consider the following statements :

- TTL has high switching speed and good fan-out capability.
- ECL has the least propagation delay.
- I^2L uses multi-collector transistors
- N MOS has more silicon area.

Which of the statements given above are correct ?

- 1, 2 and 3
- 2 and 4
- 1, 3 and 4
- 1, 2, 3 and 4

53. Which one of the following statements is correct?

An ideal regulated power supply should have

- 100% regulation
- 50% regulation
- 0% regulation
- 75% regulation

54. Match List I with List II and select the correct answer using the codes given below

List I (Operation)

- Counting
- Decoding
- Data selection
- Code conversion

List II (Associated Device)

- ROM
- Multiplexer

3. Demultiplexer

4. Register

| | A | B | C | D |
|----|---|---|---|---|
| a. | 3 | 4 | 2 | 1 |
| b. | 3 | 4 | 1 | 2 |
| c. | 4 | 3 | 1 | 2 |
| d. | 4 | 3 | 2 | 1 |

55. Which one of the following statements is correct?

A photodiode works on the principle of

- photo-voltaic effect
- photo-conductive effect
- photo-electric effect
- photo-thermal effect

56. Match List I with List II and select the correct answer using the codes given below:

List I (Circuit)

- Monostable multi vibrator
- Bistable multivibrator
- Clamping circuit
- Schmitt trigger

List II (Application)

- Comparator
- d.c. level translator
- Delay.
- Voltage controlled oscillator
- Counter

| | A | B | C | D |
|----|---|---|---|---|
| a. | 4 | 3 | 1 | 2 |
| b. | 3 | 5 | 2 | 1 |
| c. | 4 | 5 | 2 | 1 |
| d. | 5 | 4 | 1 | 2 |

57. What are the values respectively, of R_1 and R_2 in the expression

$$(235)R_1 = (565)_{10} = (865)R_2 ?$$

- 8, 16
- 16, 8
- 6, 16
- 12, 8

58. Match List I (Sections of a Service Voltage Regulator) with List II (Elements used in these Sections) and select the correct answer using the codes given below:

List I

- A. Reference source
- B. Error detector
- C. Control device
- D. Current limit

List II

1. Op-Amp
2. BJT
3. Zener diode
4. Short circuit protection

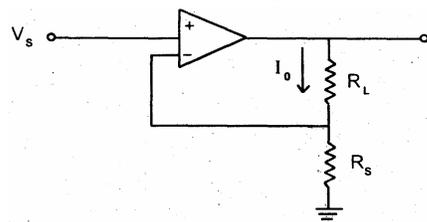
| | A | B | C | D |
|----|---|---|---|---|
| a. | 3 | 1 | 2 | 4 |
| b. | 3 | 2 | 1 | 4 |
| c. | 4 | 2 | 1 | 3 |
| d. | 4 | 1 | 2 | 3 |

59. Which one of the following statements is correct?

The efficiency of class B push-pull amplifiers is much higher than that of class A amplifiers primarily because

- a. the distortion is kept within acceptable limits
- b. one half of the input signal is amplified using one transistor and the other half is phase-inverted and fed to the other transistor
- c. matched pair transistors are used in push-pull operation
- d. the, quiescent d.c. current is avoided the class B

60. Consider the following circuit:



Which one of the following is the correct expression for the Current I_0 ?

- a. $\frac{V_s \cdot R_L}{R_s(R_L + R_s)}$
- b. $\frac{V_s}{R_s}$
- c. $\frac{V_s}{R_L}$
- d. $V_s \left(\frac{1}{R_L} + \frac{1}{R_s} \right)$

61. It is required to construct a 2^n -to-1 multiplexer by using 2-to-1 multiplexers only. How many of 2-to-1 multiplexers are needed?

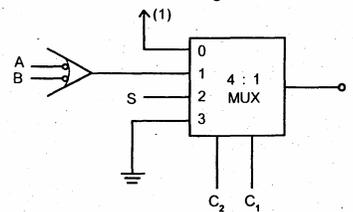
- a. n
- b. 2^{2n}
- c. 2^{n-1}
- d. $2^n - 1$

62. A inverter gate has guaranteed output levels as:

logic '1' = 3.8 V and logic '0' = 0.7 V. The maximum low level input voltage at which the output remains high 2 V. The minimum high-level input voltage at which the output remains low = 3.1 V. What are the noise margins of this gate ?

- a. $NM_H = 2.4$ V, $NM_L = 1.8$ V
- b. $NM_H = 1.8$ V, $NM_L = 1.3$ V
- c. $NM_H = 0.7$ V, $NM_L = 1.8$ V
- d. $NM_H = 0.7$ V, $NM_L = 1.3$ V

63. Consider the following circuit :



Which one of the following gives the function implemented by the MUX-based digital circuit ?

- a. $f = C_2 \cdot C_1 \cdot S + \overline{C_2} \cdot C_1 \cdot (\overline{A} + \overline{B})$
- b. $f = \overline{C_2} \cdot \overline{C_1} \cdot C_2 \cdot C_1 + C_2 \cdot \overline{C_1} \cdot S + \overline{C_2} \cdot C_1 \cdot \overline{A} \cdot \overline{B}$
- c. $f = \overline{A} \cdot \overline{B} + S$
- d. $f = \overline{C_2} \cdot \overline{C_1} + C_2 \cdot \overline{C_1} \cdot S + \overline{C_2} \cdot C_1 \cdot \overline{A} \cdot \overline{B}$

64. Which one of the following statements is correct?

For a 4-input NOR gate, when only two inputs are to be used, the best option for the unused inputs is to

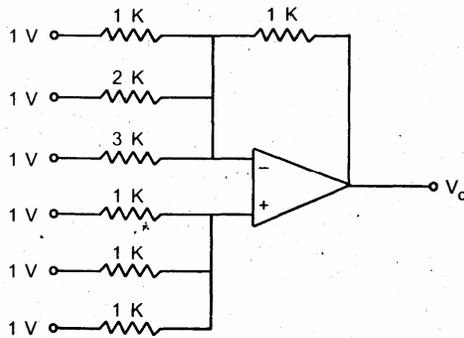
- a. connect them to the ground
- b. connect them to V_{CC}
- c. keep them open
- d. connect them to the used inputs

65. A range decoder is a 'digital circuit which outputs a '1' whenever an m-bit number X falls within the range, $2^p \leq X \leq 2^q$, $0 \leq p, q$

$\leq m-1$. Which one of the following functions describes the range-decoder?

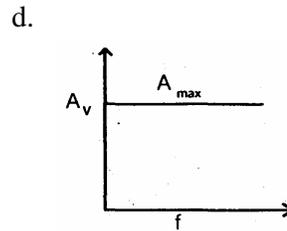
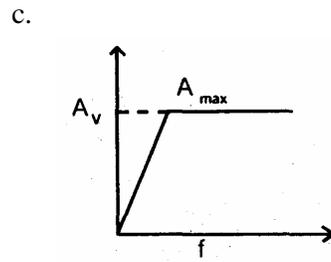
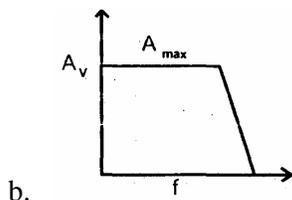
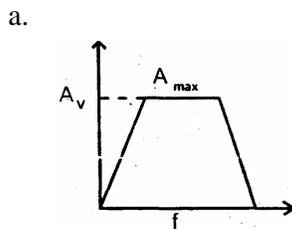
- a. $(X_p \cdot X_{p+1} \cdots X_{q-1} \cdot X_q)$
 $(X_{q+1} + X_{q+2} + \cdots + X_{m-1})$
- b. $(X_p \oplus X_{p+1} \oplus \cdots X_q)$
 $(X_{q+1} + \bar{X}_{q+2} + \cdots + \bar{X}_{m-1})$
- c. $(X_p + X_{p+1} + \cdots + X_{q-1} + X_q)$
 $(X_{q+1} \cdots \bar{X}_{m-1})$
- d. $(X_0 + X_1 + X_2 + \cdots + X_q)$
 $(X_{q+1} \cdot \bar{X}_{q+2} \cdots \bar{X}_{m-1})$

66. Consider the following circuit :

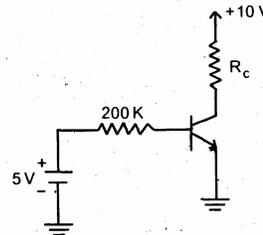


What is the output voltage V_0 in the above circuit ?

- a. 9.5 V
 - b. 3 V
 - c. 32.2 V
 - d. 1 V
67. If the coupling capacitors of a CE transistor amplifier is shorted, which one of the following graphs will represent the frequency response curve of the amplifier? (A_v voltage gain, f = frequency in Hertz, A_{max} = maximum value of A_v)



68. A silicon transistor with $V_{BE_{sat}} = 0.8$ V, $\beta_{dc} = 100$ and $V_{CE_{sat}} = 0.2$ V is used in the circuit shown below :



What is the minimum value of R_c for which transistor is in saturation?

- a. 4286 Ω
 - b. 4667 Ω
 - c. 5000 Ω
 - d. 1000 Ω
69. For a JK flip-flop, Q_n is output at time step t_n . Which of the following Boolean expressions represents Q_{n+1} ?

- a. $J_n \bar{Q}_n + \bar{K}_n Q_n$
- b. $J_n Q_n + K_n \bar{Q}_n$
- c. $\bar{J}_n Q_n + K_n \bar{Q}_n$
- d. $J_n Q_n + \bar{K}_n \bar{Q}_n$

70. Which one of the following statements is correct?

In Intel 8085, the interrupt enable flip-flop is reset by

- a. DI instructions only
- b. system RESET only
- c. interrupt acknowledgement only
- d. either DI or system RESET or interrupt acknowledgement

71. Match List I (Instruction) with List II (Operation) for Intel 8085 and select the correct answer using the codes given below:
- List I**
- PCHL
 - SPHL
 - XTHL
 - XCHG
- List II**
- Exchange the top of the stack with the contents of HL pair
 - Exchange the contents of HL with those of DE pair
 - Transfer the contents of HL to the stack pointer
 - Transfer the contents of HL to the programme counter
- | | A | B | C | D |
|----|---|---|---|---|
| a. | 3 | 4 | 1 | 2 |
| b. | 3 | 4 | 2 | 1 |
| c. | 4 | 3 | 2 | 1 |
| d. | 4 | 3 | 1 | 2 |
72. Match List I (Instruction) with List II (Application) and select the correct answer using the codes given below:
- List I**
- SIM
 - DAD
 - DAA
 - SPHL
- List II**
- 16-bit addition
 - Initializing the stack pointer
 - Serial output data
 - Checking the current interrupt mask setting
 - BCD addition
- | | A | B | C | D |
|----|---|---|---|---|
| a. | 5 | 4 | 2 | 1 |
| b. | 3 | 1 | 5 | 4 |
| c. | 5 | 1 | 2 | 4 |
| d. | 3 | 4 | 5 | 1 |
73. Which one of the following statements is correct?
- ROM is a Read/Write Memory
 - PC points to the last instruction that was executed
 - Stack works on the principle of LIFO
 - All instructions affect the flags
74. Consider the following multiplication $(10w1z)_2 \times (15)_{10} = (y01011001)_2$ Which one of the following gives appropriate values of w, y and z ?
- w = 0, y = 0, z = 1
 - w = 0, y = 1, z = 1
 - w = 1, y = 1, z = 1
 - w = 1, y = 1, z = 0
75. What must be the contents of the control word of Intel 8255 for Mode O(operation) and for the following ports configuration: Port A – output, Port B – output, Port C_{lower} – output, Port C_{upper} – input ?
- 85 H
 - 86 H
 - 87 H
 - 88H
76. Which one of the following 8085 assembly language instructions does not affect the contents of the accumulator?
- CMA
 - CMPB
 - DAA
 - ADDB
77. MC 1488 and MC 1489 are needed when using RS 232 for which one of the following?
- To convert the logical levels at the receiving and sending ends of RS 232 into TTL compatible levels
 - To convert the TTL level voltages at the sending and receiving ends of RS 232 to ± 12 V level
 - They are not required while using RS 232
 - To improve the current drive of the RS 232 output signals
78. Which one of the following statements for Intel 8085 is correct?
- Program counter (PC) specifies the address of the instruction last executed
 - PC specifies the address of the instruction being executed

- c. PC specifies the address of the instruction to be executed
 d. PC specifies the number of instructions executed so far
79. Match List I (Interrupts) with List II (Corresponding Characteristics) and select the correct answer using the codes given below:
- List I**
- A. TRAP
 B. INTR
 C. RST 7.5
 D. RST 6.5
- List II**
1. Level triggered
 2. Non maskable
 3. For increasing the number of interrupts
 4. Positive edge triggered
- | | A | B | C | D |
|----|---|---|---|---|
| a. | 2 | 4 | 3 | 1 |
| b. | 1 | 4 | 3 | 2 |
| c. | 1 | 3 | 4 | 2 |
| d. | 2 | 3 | 4 | 1 |
80. What is the total number of memory locations and input-output devices that can be addressed with a processor having 16-bits address bus, using memory mapped I/O ?
- a. 64 K memory locations and 256 I/O devices
 b. 256 I/O devices and 65279 memory locations
 c. 64 K memory locations and no I/O devices
 d. 64 K memory locations or input-output devices
81. For Intel 8085, match List I (Addressing Mode) with List II (Instruction) and select the correct answer using the codes given below :
- List I**
- A. Implicit addressing
 B. Register-indirect
 C. Immediate
 D. Direct addressing
- List II**
1. JMP 3 FAO H
 2. MOV A, M
3. LDA 03 FC H
 4. RAL
- | | A | B | C | D |
|----|---|---|---|---|
| a. | 4 | 1 | 2 | 3 |
| b. | 4 | 2 | 1 | 3 |
| c. | 3 | 2 | 1 | 4 |
| d. | 3 | 1 | 2 | 4 |
82. A memory system of 64 kbytes needs to be designed with RAM chips of 1 kbyte each, and a decoder tree constructed with 2 : 4 decoder chips with "Enable" input. What is the total number of decoder chips ?
- a. 21
 b. 64
 c. 32
 d. 25
83. Match List I with List II and select the correct answer using the codes given below:
- List I**
- A. Monitor program
 B. Assembler
 C. Mnemonic
 D. Program counter
- List II**
1. Used to indicate memory location
 2. A combination of letters, symbols and numerals
 3. A program that translates symbolic instructions into binary equivalent
 4. An operating system
- | | A | B | C | D |
|----|---|---|---|---|
| a. | 4 | 3 | 2 | 1 |
| b. | 4 | 3 | 1 | 2 |
| c. | 3 | 4 | 1 | 2 |
| d. | 3 | 4 | 2 | 1 |
84. Which one of the following statements is correct?
 In PCM, the conditional probability of error is proportional to
- a. noise power (N_0)
 b. Peak signal energy (E_{\max})
 c. $\sqrt{N_0}$
 d. $\sqrt{E_{\max}}$
85. Which one of the following statements is correct?

- In TDM, non-essential frequency components of the modulating signal are removed by
- sampler
 - attenuator
 - pre-alias filter
 - modulator
86. Which one of the following statements is correct?
For coherent detection of digital signals, the receiver must be
- synchronized in time only
 - synchronized in phase only
 - synchronized in time and phase
 - unsynchronized
87. A single-phase inverter has square wave output voltage. What is the percentage of the fifth harmonic component in relation to the fundamental component?
- 40%
 - 30%
 - 20%
 - 10%
88. For a binary symmetric channel, which one of the following is the correct expression for entropy ?
(p = conditional probability of error).
- $p \log_2 (1/p) + (1 - p) \log_2 \{1/(1-p)\}$
 - $p \log_2 (1/(1-p)) + (1 - p) \log_2 (1/p)$
 - $2 \log_2 (1/p) + 2 \log_2 \{1/1-p\}$
 - $(1-p) \{ \log_2 (1/p) \} + \log_2 \{ (1/1-p) \}$
89. In amplitude modulation, the modulation envelope has a peak value which is double the unmodulated carrier value. What is the value of the modulation index ?
- 25%
 - 50%
 - 75%
 - 100%
90. S_1 and S_0 denote the signal at input and output of a linear network. N_i and N_0 are the corresponding noises. Which one of the following is the correct expression for noise figure of the network?
- $\frac{S_i S_0}{N_i N_0}$
 - $\frac{S_i N_i}{S_0 N_0}$
 - $\frac{S_i N_0}{S_0 N_i}$
 - $\frac{S_0 N_0}{S_i N_i}$
91. Which one of the following statements is correct?
One hundred percent modulation of the carrier for the broadcast FM radio band is achieved when
- carrier frequency changed by $\pm 100\%$
 - carrier envelope changed by $\pm 100\%$
 - carrier frequency changes by ± 75 kHz
 - audio frequency changes by ± 15 kHz
92. In case of data transmission, which one of the following systems will give the maximum probability of error?
- ASK
 - FSK
 - PSK
 - DPSK
93. Which one of the following statements is correct?
The type of modulation used generally in TV transmission for video and audio signals, respectively are
- FM and AM
 - FM and FM
 - AM and AM
 - AM and FM
94. Match List I (FM Service Type) with List II (Channel Bandwidth) and select the correct answer using the codes given below :
- List I**
- Commercial FM radio broadcast
 - Television sound
 - Police, fire, ambulance. etc.
 - Amateur radio
- List II**
- 100 kHz
 - 15 kHz
 - 200 kHz
 - 20 kHz
- A B C D

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

95. Which one of the following statements is correct?

The capacitor charging time in the AM envelope demodulator is based on the time for one

- a. half cycle of the carrier frequency
 b. quarter cycle of the carrier frequency
 c. half cycle of the lowest audio frequency
 d. quarter cycle of the highest audio frequency

96. Which one of the following statements is correct?

Quantising noise is produced in

- a. all pulse modulation systems
 b. PCM
 c. all modulation systems
 d. FDM

97. Which one of the following statements is correct?

The equalizing pulses in television transmission are sent during

- a. vertical blanking
 b. horizontal blanking
 c. horizontal retrace
 d. picture forward trace

98. Which one of the following represents the Fourier Transform $X(j\omega)$ of the signal

$$x(t) = t e^{-at} u(t) ?$$

- a. $X(j\omega) = \frac{j\omega}{(a+j\omega)}$
 b. $X(j\omega) = \frac{j\omega}{(a+j\omega)^2}$
 c. $X(j\omega) = \frac{(a+j\omega)^2}{j\omega}$
 d. $X(j\omega) = \frac{1}{(a+j\omega)^2}$

99. Which one of the following statements is correct?

The turn off times of converter grade SCRs are normally in the range of

- a. 1 to 2 microseconds
 b. 50 to 200 microseconds
 c. 500 to 1000 microseconds
 d. 1 to 2 milliseconds

100. Which one of the following statements is correct?

A triac is a

- a. 2 terminal switch
 b. 2 terminal bilateral switch
 c. 3 terminal unilateral switch
 d. 3 terminal bidirectional switch

101. Which one of the following is the most suitable device for a d.c.-d.c. converter?

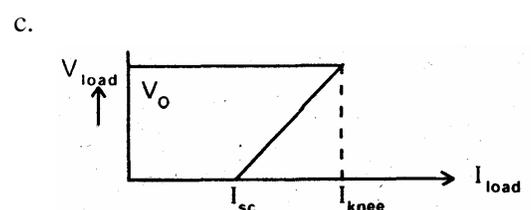
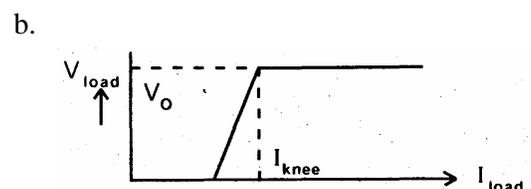
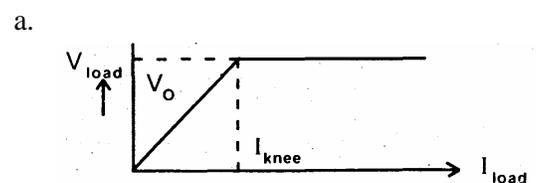
- a. BJT
 b. GTO
 c. MOSFET
 d. Thyristor

102. Which one of the following is correct?

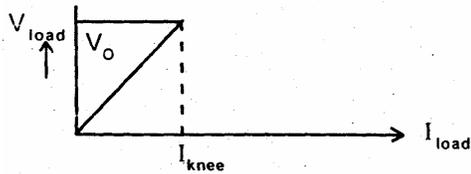
In a switched capacitor network for VAR compensation the SCRs are commutated by

- a. forced commutation
 b. resonant commutation
 c. natural commutation
 d. delayed commutation

103. Which one of the following shows current fold back characteristics curve for an SCR controlled shunt regulated power supply ?



d.



104. Which one of the following statements is correct?
In a transistor, the reverse saturation current I_{CO}
- doubles for every 10^0 C rise in temperature
 - doubles for every 1^0 C rise in temperature
 - increases linearly with temperature
 - decreases linearly with temperature
105. Which one of the following statements is correct?
In a thyristor, the holding current I_H is
- more than the latching current I_L
 - less than I_L
 - equal to I_L
 - equal to zero
106. Which one of the following statements is correct?
For an SCR, dv/dt protection is achieved through the use of
- RL in series with SCR
 - RC across SCR
 - L in series with SCR
 - RC in series with SCR
107. A power diode is in the forward conduction mode and the forward current is now decreased. The reverse recovery time of the diode is t_r and the rate of fall of the diode current is di/dt .
What is the stored charge ?
- $(di/dt) \cdot t_r$
 - $1/2 (di/dt) \cdot t_r^2$
 - $(di/dt) \cdot t_r^2$
 - $1/2 (di/dt) \cdot t_r$
108. In the buck-boost converter, what is the maximum value of the switch utilization factor ?
- 1.00
 - 0.75
 - 0.50
 - 0.25
109. Which one of the following statements is correct?
In order to get best results per unit cost, the heat sinks on which the thyristors are mounted, are made of
- aluminium
 - copper
 - nickel
 - stainless steel
110. Which one of the following capacitors is suitable for compensation of harmonic and reactive power?
- Mica capacitor
 - Glass capacitor
 - Polypropylene capacitor
 - Electrolytic capacitor
111. Which one of the following statements is correct?
The function of bleeder resistor in a power supply is
- to ensure a minimum current drain in the circuit
 - to increase the output d.c. voltage
 - to increase the output current
 - same as that of a load resistor
112. Which one of the following is used as the main switching element in a switched mode power supply operating in 20 kHz to 100 kHz range?
- Thyristor
 - MOSFET
 - Triac
 - UJT
113. Assertion (A) : The main advantage of decoupled load flow (DLF) method as compared to Newton Raphson method is its reduced memory requirements in storing the Jacobian.
Reason (R) : An important characteristic of any practical electric power transmission system operating in steady state is the strong interdependence between the real power and bus voltage angles, and between the reactive powers and voltage magnitudes.
- Both A and R are individually true and R is the correct explanation of A
 - Both A and R are individually true but R is not the correct explanation of A

- c. A is true but R is false
d. A is false but R is true
114. Assertion (A) : A single-phase induction motor is not self-starting as such.
Reason (R) : A single-phase induction motor develops only pulsating magnetic field which provides zero torque at standstill.
- Both A and R are individually true and R is the correct explanation of A
 - Both A and R are individually true but R is not the correct explanation of A
 - A is true but R is false
 - A is false but R is true
115. Assertion (A) : In the “3-point” type of starter of a d.c. series motor, the “holding coil” for holding the starter handle in the “ON” stud is connected in such a manner that it is short-circuited when the “over load” relay picks up.
Reason (R) : In a d.c. series motor starter, to guard against “racing” due to sudden large reduction of shaft-load, the “holding coil” is connected in series with the armature circuit and the series field winding.
- Both A and R are individually true and R is the correct explanation of A
 - Both A and R are individually true but R is not the correct explanation of A
 - A is true but R is false
 - A is false but R is true
116. Assertion (A) : A synchronous motor operating from constant voltage and constant frequency source has a substantially constant resultant air-gap flux.
Reason (R) : If the d.c. field current in this motor can set up the required resultant air-gap flux, the lagging reactive volt-amperes drawn from a.c. source is zero.
- Both A and R are individually true and R is the correct explanation of A
 - Both A and R are individually true but R is not the correct explanation of A
 - A is true but R is false
 - A is false but R is true
117. Assertion (A) : Transformer is not used in a d.c. line.
Reason (R) : Losses in the d.c. circuit are not negligible.
- Both A and R are individually true and R is the correct explanation of A
 - Both A and R are individually true but R is not the correct explanation of A
 - A is true but R is false
 - A is false but R is true
118. Assertion (A) : Δ -connected tertiary windings tend to act as an automatic feedback control system.
Reason (R) : In the event of unbalanced secondary load currents, both secondary and primary load voltages are restored, to their normal phase magnitude and angle.
- Both A and R are individually true and R is the correct explanation of A
 - Both A and R are individually true but R is not the correct explanation of A
 - A is true but R is false
 - A is false but R is true
119. Assertion (A) : If the load requirement of a synchronous motor exceeds the pull-out torque, the synchronous motor action is lost.
Reason (R) : Rotor and stator fields are no longer stationary with respect to each other.
- Both A and R are individually true and R is the correct explanation of A
 - Both A and R are individually true but R is not the correct explanation of A
 - A is true but R is false
 - A is false but R is true
120. Assertion (A) : In a thyristor-controlled reactor, a minimum of 3 to 4 thyristors must be provided as redundant in capacitor switching.
Reason (R) : It is desired to protect the whole string against unexpected transients.
- Both A and R are individually true and R is the correct explanation of A
 - Both A and R are individually true but R is not the correct explanation of A
 - A is true but R is false
 - A is false but R is true