



UPPCL JE

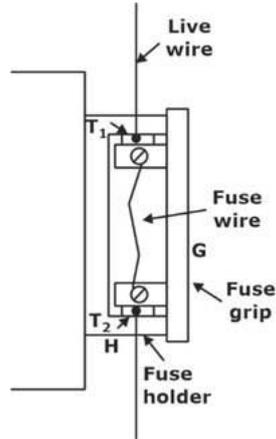
Electrical Engineering

Mega Mock Test

(March 30th - March 31th 2022)

Questions &
Solutions

1. Which type of fuse is shown in the given diagram?



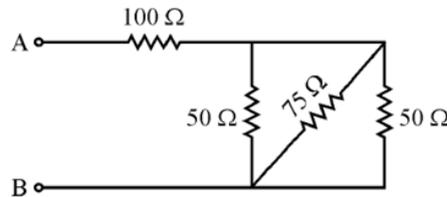
- A. Link type cartridge
- B. HRC
- C. Rewireable fuse
- D. D-type cartridge fuse

Ans. C

Sol.

Link type Cartridge	
HRC	
Rewireable fuse	
D-type cartridge fuse	

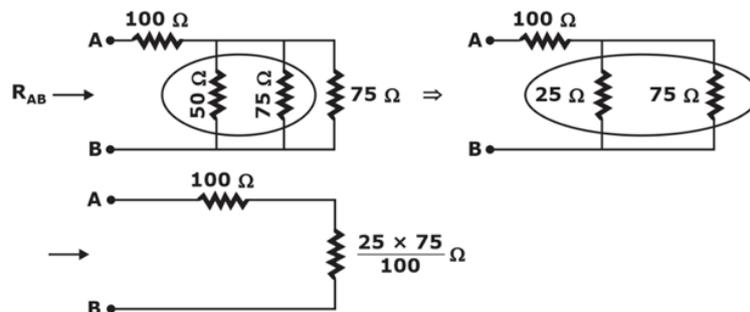
2. In the following figure, the equivalent resistance at terminals A and B will be



- A. 275 Ω
- B. 180 Ω
- C. 118.75 Ω
- D. None of these

Ans. C

Sol.



$$R_{AB} = 100 + \frac{75}{4} = 118.75\Omega$$

3. For a transistor, turn-off time is
- A. Sum of storage time and fall time
 - B. Maximum value of storage time
 - C. Maximum value of fall time
 - D. Sum of rise time and fall time

Ans. A

Sol. Turn-off time = storage time + fall time
 (for change (time taken Carriers to for current Reach in their to reduce Original condition) to zero)

4. If a capacitance is charged by a square wave current source, then the voltage across the capacitor will be
- A. square wave
 - B. Step function
 - C. Triangular wave
 - D. Zero

Ans. C

Sol.

$$I_c = C \frac{dv}{dt}$$

$$V = \frac{1}{C} \int I dt$$

∴ Integration of square wave is Triangular wave.

5. Which of the following statement is/are correct about transformer?
- 1) Core type transformer require more amount of copper as compared to shell type transformer
 - 2) Size of distribution transformer is smaller as compared to similar power transformer
 - 3) Auto transformer has lower p.u impedance as compared to two winding transformer
 - 4) Shell type transformer is suitable for low voltage and low power applications.
- A. 1, 2 and 3
 - B. 1, 2 and 4
 - C. 1, 3 and 4
 - D. 1, 2, 3 and 4

Ans. C

Sol. **Core type transformer:**

- Require more amount of copper.
- Suitable for low flux density application.
- It requires less amount of insulation. So, it is suitable for high voltage and high power applications.

Shell type transformer:

- Suitable for low voltage and low power applications.
- Auto transformer has higher efficiency, lower p.u. impedance and lower voltage regulation as compared to 2-winding transformer.
- Size of distribution transformer is larger as compared to similar power transformer as iron to copper ratio of distribution transformer is higher.

6. Which one of the following heating method is most inefficient method of electrical heating?
- A. Infrared Heating
 - B. Resistance Heating
 - C. Dielectric Heating
 - D. Induction Heating

Ans. A

Sol. Infrared Heating is the most inefficient method of electric heating. It is also the simplest form of electric heating. Here the electromagnetic radiation coming out from an incandescent light bulb is focused to the surface to be heated. It is mostly used for drying out the wet painted surface of an object.

7. What can be done in order to prevent Creeping in Energy meters?

- A. Two diametrically opposite holes are drilled in the disc
- B. Creeping can't be prevented
- C. Friction is over compensated
- D. Disc is made to run where there is no current

Ans. A

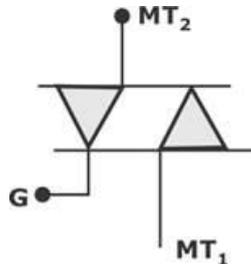
Sol. If the friction is overcompensated by placing the shading loop near the potential coil, then disc start rotating with only potential coil excited without connecting the load is called creeping. To reduce this effect holes or slot are made on the opposite side of the spindle in the disc and a torque is produced due to side limbs of the shunt magnet opposed to each other so that creeping stops.

8. Triac can conduct with

- A. positive voltage at gate only.
- B. Negative voltage at gate only.
- C. Either positive or negative voltage at gate.
- D. Conduct without gate signal.

Ans. C

Sol. Triac



1.3 terminal bidirectional switch.

2.Can conduct with either positive or negative voltage at gate.

3.It is equivalent to two thyristors connected back-to-back with their gate terminals tied up.

9. At 1.5 GHz a general transmission line of 50Ω has following parameters:

$R = 2\Omega/m$, $G = 0.06 S/m$, $L = 8 nH/m$ and $C = 110 pF/m$. What will be the value of the

propagation constant (γ) in m^{-1} ?

- A. $\gamma = 8.84 \angle 13.23^\circ$
- B. $\gamma = 7.84 \angle 13.23^\circ$
- C. $\gamma = 6.84 \angle 13.23^\circ$
- D. $\gamma = 5.84 \angle 13.23^\circ$

Ans. A

Sol. $f = 1.5 GHz$

$R = 2 \Omega/m$

$G = 0.06 S/m$

Ans. B

Sol. The following motors are considered to be the commutator motors:

- 1) AC series motor
- 2) Universal motor
- 3) Repulsion motor

15. The expression for the transconductance for JEET is given by:

<p>A. $g_m = \frac{2I_{DSS}}{ V_p } \left[1 - \frac{V_{GS}}{V_p} \right]$</p> <p>C. $g_m = \frac{2I_{DSS}}{ V_{GS} } \left[1 - \frac{V_{GS}}{V_p} \right]$</p>	<p>B. $g_m = \frac{I_{DSS}}{ V_p } \left[1 - \frac{V_{GS}}{V_p} \right]$</p> <p>D. $g_m = \frac{2I_{OSS}}{V_{GS}} \left[1 - \frac{V_{GS}}{V_p} \right]^2$</p>
--	---

Ans. A

Sol.

Transconductance is given as: $g_m = \frac{\Delta I_o}{\Delta V_{GS}} \Big|_{Q\text{-point}} = \frac{dI_o}{dV_{GS}} \Big|_{Q\text{-point}}$

Drain current, $I_D = I_{DSS} \left(1 - \frac{V_{GS}}{V_p} \right)^2$

$$g_m = \frac{2I_{DSS}}{|V_p|} \left[1 - \frac{V_{GS}}{V_p} \right]$$

Here, $|V_p|$ denotes magnitude only to ensure a positive value of g_m .

16. A voltmeter has resistance of 2000 Ω , when it is connected across a DC circuit its power consumption is 2 mW. Suppose this voltmeter is replaced by a voltmeter of 4000 Ω resistance, the power consumption will be:

- | | |
|---------|---------|
| A. 2 mW | B. 4 mW |
| C. 3 mW | D. 1 mW |

Ans. D

Sol. Resistance of the voltmeter, $R_v = 2000 \Omega$

It consumes 2 mW of power

Resistance of new voltmeter, $R_v' = 4000 \Omega$

In voltmeter, voltage remains the same.

$$P = I^2 R$$

$$2 \times 10^{-3} = I^2 \times 2000$$

$$I^2 = 10^{-6}$$

$$I = 10^{-3} \text{ A} = 1 \text{ mA}$$

$$V = IR = 10^{-3} \times 2000 = 2 \text{ V}$$

$$R_v' = 4000 \Omega$$

$$P' = \frac{V^2}{R} = \frac{(2)^2}{4000} = \frac{4}{4000} = 10^{-3} = 1 \text{ mW}$$

17. Minimum time period that a microcontroller can measure depends upon
- A. Clock frequency
 - B. size of counter/timer
 - C. Both A and B
 - D. None of these

Ans. A

Sol. Minimum time period that a microcontroller can measure depends upon Clock frequency.

18. Phantom loading in an energy meter is used because
- A. the arrangement gives accurate result.
 - B. the onside calibration is possible
 - C. power consumed in calibration work is minimized
 - D. None of these

Ans. C

Sol. The phantom loading in an energy meter is used to reduce the power consumption in its calibration work.

19. The commutator in a DC machine acts as
- A. a mechanical inverter
 - B. a mechanical rectifier
 - C. current controller
 - D. either (A) or (B)

Ans. D

Sol. Commutator in dc machine act both as inverter and rectifier. Commutator acts as mechanical Inverter in case of DC motor and as mechanical rectifier in case of DC generator.

20. Match List-I (Diode) with List-II (Application) and select the correct answer using the codes given below the lists:

List-I

- A- Varactor diode
- B- Tunnel diode
- C- Photodiode
- D- Zener diode

List-II

- 1- To charge auxiliary storage batteries
- 2- Reference voltage
- 3- High frequency tuning circuits
- 4- High frequency switching circuit

Codes:

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

Ans. C

Sol. (i) Zener diode is used for reference voltage.
(ii) Tunnel diode is a high frequency switching circuit.
(iii) Varactor diode is used for high frequency tuning purposes.

21. The number of iterations required to reach convergence in the Gauss-Seidel method of load flow analysis are:
- A. dependent on the size of the system, and decrease with the increase in the size of the system
 - B. dependent on the size of the system, and increase with the increase in the size of the system
 - C. dependent on the size of the system, and increase with the decrease in the size of the system
 - D. independent of the size of the system

Ans. B

Sol. The number of iterations to reach convergence in the Gauss-seidel method of load flow analysis are dependent on the size of the system and increase with increase in the size of the system.

22. A salient-pole synchronous motor is operating 1/4 full load. If its field current is suddenly switched off, it would?
- A. run at sub-synchronous speed
 - B. stop running
 - C. continue to run at synchronous speed
 - D. run at super-synchronous speed

Ans. A

Sol. If field current is switched off, the rotor will fall out of synchronism and eventually stop. However if the field coil on rotor is immediately shorted taking out of DC supply, the motor will behave like an induction motor.

To maintain synchronous speed at the situation you described, the synchronous motor need to be coupled to another induction motor of rated synchronous speed.

23. A PAL logic device generally consists:
- A. Fixed OR and fixed AND array
 - B. Fixed OR and programmable AND array
 - C. Programmable AND and programmable OR array
 - D. Fixed AND and programmable OR array

Ans. B

Sol. Fixed OR and programmable AND array

24. Which of the following set of IE rules related to additional provisions for use of energy at high and extra high voltage –
- A. IE Rule – 50
 - B. IE Rule – 61
 - C. IE Rule – 64A
 - D. IE Rule – 44A

Ans. C

Sol. IE Rule 50 is about supply and use of energy.
IE Rule 61 is about connection with earth.
IE Rule 64 A is about additional provisions for use of energy at high and extra high voltage.
IE Rule 44 A is about intimation of accident.

25. What is the approximate impedance of a CRO?
- A. 0
 - B. 1 Mega Ohm
 - C. 10 Ohm
 - D. 10 Tera Ohm

Ans. B

Sol. Approximate impedance of CRO is 1 mega ohm.

26. In a 132 kV system, Phase to Ground capacitance is 0.01 μ F and inductance is 4H. Calculate the critical resistance to be connected in order to eliminate restriking if a magnetizing current of 5 A is interrupted by the circuit

- A. 20 k Ω
- B. 10 k Ω
- C. 100 k Ω
- D. 200 k Ω

Ans. B

Sol. Critical resistance

$$R = \frac{1}{2} \sqrt{\frac{L}{C}} = \frac{1}{2} \sqrt{\frac{4}{0.01 \times 10^{-6}}}$$
$$= 10 \text{ k}\Omega$$

27. For a forward biased pn-junction diode, the diffusion capacitance varies as

- A. Linearly with current
- B. Square of current
- C. Inversely with current
- D. Does not vary with current

Ans. A

Sol. For a forward biased pn-junction diode diffusion capacitance varies linearly with current.

1) When the junction is forward biased, a capacitance comes into play, that is known as diffusion capacitance denoted as CD. It is much greater than the transition capacitance.

2) The density of the charge carriers is high near the junction and reduces or decays as the distance increases.

3) Thus, in this case charge is stored on both side of the junction and varies with the applied potential. So as per definition change in charge with respect to applied voltage results in capacitance which here is called as diffusion capacitance.

4) The diffusion capacitance is directly proportional to the diode current.

28. The overall power factor of an On-load transformer_____,.

- A. depends on the power factor of the load.
- B. is always lagging
- C. is always unity
- D. is always leading

Ans. A

Sol. Whenever we calculate over all power factor of a transformer, we consider the impedance of the electrically loaded transformer which consists of impedance of that transformer and impedance of its load. As power factor of load depends upon its nature of impedance, obviously overall power factor of an on-load transformers depends on the power factor of the load.

29. Consider the following statements:

A semiconductor to be used in opto-electronic devices should have

- 1- direct energy band gap.
- 2- indirect energy band gap.
- 3- any value of forbidden energy band gap.
- 4- right value of band gap corresponding to light wavelength.

Which of these statements is/are correct?

- A. 1 only
- B. 1 and 4
- C. 2 and 3
- D. 2 and 4

Ans. B

Sol. When an electron in the direct band gap material jumps from higher energy state into lower energy state, it releases energy in the form of light.

In indirect band gap material, this energy is released in the form of heat.

30. A 100 mA meter has accuracy of $\pm 2\%$. What will be the accuracy while reading 50 mA ?

- A. $\pm 1\%$
- B. $\pm 2\%$
- C. $\pm 4\%$
- D. $\pm 20\%$

Ans. C

Sol. The error while measuring 100 mA = $\frac{100 \times 2}{100} = 2\text{mA}$

Accuracy while measuring 50 mA = $\frac{2}{50} \times 100 = 2 \times 2 = \pm 4\%$

31. The meaning of uploading in PLC is _____.

- A. Transferring program from programming device.
- B. Transferring program from output device to PLC
- C. Transferring user program from PLC to programming device.
- D. Transferring program from memory to PLC's.

Ans. C

Sol. • Most of the PLC use the term 'upload' to mean transfer from the PLC, and 'download' to mean transfer to the PLC.

32. Step down chopper is used for

- A. Rectification
- B. Inverting
- C. Voltage regulator
- D. None

Ans. A

Sol. Mode of operation is shown below

Quadrant of operation	Voltage & current	Mode of operation	Application
1	V = +ve I = +ve	Forward motoring (Rectification)	Step-down chopper
2	V = +ve I = -ve	Forward regeneration (inverting)	Step-up chopper
3	V = -ve I = -ve	Reverse motoring (Rectification)	Step-down chopper
4	V = -ve I = +ve	Reverse regeneration (inverting)	Step-up chopper

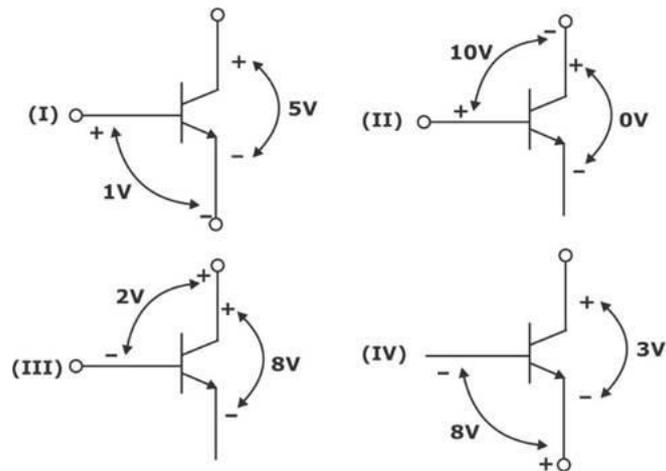
33. In a synchronous motor, the torque angle is the angle between

- A. magnetizing current and back e.m.f.
- B. the rotating stator flux and rotor poles
- C. the supply voltage and the back e.m.f.
- D. None of these

Ans. B

Sol. The torque angle or load angle is the rotating stator flux and rotor poles.

34. Consider the circuits shown below, identify the region of operation, then which of the following is correct?



- A. I in saturation region
- B. II in active region
- C. III in saturation region
- D. IV in cut off region

Ans. D

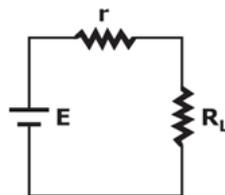
Sol. (I) $V_{BE} = 1V, V_{CE} = 5V$
 $V_{CE} > V_{BE} \rightarrow$ Active region
 (II) $V_{CE} = 0V; V_{BC} > 0V$ or $10V$
 Hence, $V_{BE} > 0$ or $10V$
 \rightarrow saturation region
 (III) $V_{BE} = ?, V_{CE} = 8V, V_{BC} = -2V \rightarrow V_{CB} = 2V$
 Hence, $V_{BE} > 0$ Active region
 (IV) $V_{BE} = -8V, V_{CE} = 3V$
 Cut off region

35. The maximum power dissipation in a resistance from a battery of electromotive force 'E' and internal resistance 'r' will be

- A. $\frac{E^2}{8r}$
- B. $\frac{E^2}{4r}$
- C. $\frac{E^2}{2r}$
- D. $\frac{E^2}{r}$

Ans. B

Sol.



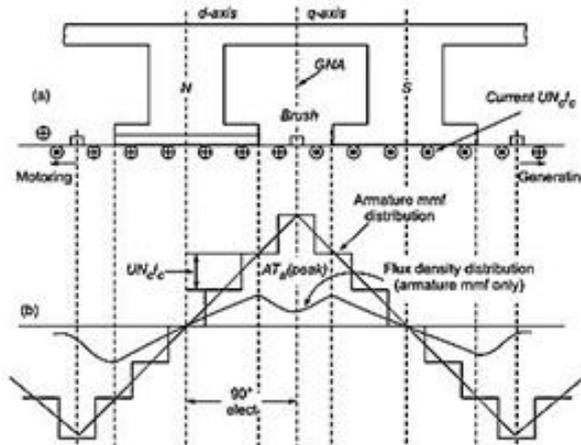
\Rightarrow Maximum Power will transfer if $R_L = r$

$$\therefore P_{max} = I^2 R_L = \left(\frac{E}{2R_L} \right)^2 \times R_L = \frac{E^2}{4R_L} = \frac{E^2}{4r}$$

36. The wave form of the armature m.m.f. in DC machine is _____.
- A. square
 - B. rectangular
 - C. triangular
 - D. sinusoidal

Ans. C

Sol. The armature mmf of a distributed armature winding of a dc machine is triangular in shape as shown in Fig. In a D.C. machine, the armature M.M.F. wave has its maximum value at fixed points between the main poles, and its chief effect is to increase the flux density on one side of the pole and reduce it on the other



At GNA (Geometrical neutral axis) MMF Attends it's maximum value MMF and at MNA (Magnetic neutral axis) MMF Attends zero value, it is alternating in nature.

At MNA axis the armature conductors are situated in parallel with the field flux thus induced EMF is zero at that time and at GNA axis the armature conductors are situated at 90 ° with the field fluxes, between MNA and GNA the armature MMF slowly rise as the angle between an armature conductor and field flux increases the MMF induced on that conductor increases thus it creates a triangular form of armature MMF.

37. Which power plant will have high capital initial cost?
- A. Diesel power plant
 - B. Gas power plant
 - C. Steam power plant
 - D. Nuclear power plant

Ans. D

Sol.

Power Plant	Capital Cost (Rs)
Diesel power plant	3000-7000 per kW
Gas power plant	5000-15000 per kW
Steam power plant	4000-5000 per kW
Nuclear power plant	20000-55000 per kW

38. The illumination level in houses is in range
- A. 10-20 lumen/m²
 - B. 30-50 lumen/m²
 - C. 40-75 lumen/m²
 - D. 100-140 lumen/m²

Ans. D

Sol. The illumination level in houses is in the range of 100-140 lumen/m².

39. If a 220 V heater is used on 110 V supply, the heat produced by it will be nearly

- A. one half
- B. twice
- C. one-fourth
- D. four times

Ans. D

Sol. Heat is Proportional to power loss.

$$\text{Power loss} = \frac{V^2}{R}$$

$$\therefore \frac{P_1}{P_2} = \left(\frac{V_1}{V_2}\right)^2$$

$$V_1 = 110V$$

$$V_2 = 220V$$

$$\Rightarrow P_2 = P_1 \left(\frac{V_2}{V_1}\right)^2 = 4P_1$$

\therefore Heat will produce four times with 220V.

40. The Fermi level in N-type semiconductor is given by

- A. $E_F = E_C - kT \ln \left(\frac{N_C}{N_D}\right)$
- B. $E_F = E_C - 0.5kT \ln \left(\frac{N_C}{N_D}\right)$
- C. $E_F = E_C + kT \ln \left(\frac{N_C}{N_D}\right)$
- D. $E_F = E_C - 0.5kT \ln \left(\frac{N_D}{N_C}\right)$

Ans. A

Sol. In an N-type semiconductor, we have:

$$n \cong N_D = N_C e^{\frac{E_C - E_F}{kT}}$$

$$\Rightarrow \frac{E_C - E_F}{kT} = \ln \left(\frac{N_D}{N_C}\right)$$

$$\Rightarrow E_F = E_C - kT \ln \left(\frac{N_C}{N_D}\right)$$

41. Express the Boolean function $F = A + \bar{B}C$ as a sum of minterms?

- A. $ABC + \bar{A}\bar{B}C$
- B. $A\bar{B}C + \bar{A}BC + A\bar{B}\bar{C}$
- C. $ABC + AB\bar{C} + A\bar{B}C + A\bar{B}\bar{C} + \bar{A}\bar{B}C$
- D. $AB\bar{C} + A\bar{B}C + \bar{A}\bar{B}\bar{C}$

Ans. C

Sol.

$$F = A + \bar{B}C$$

$$= A(\bar{B} + B) (\bar{C} + C) + (\bar{A} + A)\bar{B}C$$

$$ABC + AB\bar{C} + A\bar{B}C + A\bar{B}\bar{C} + \bar{A}\bar{B}C$$

42. The reserve generating capacity which is not in operation but can be made available for service
- A. Cold reserve
 - B. Hot reserve
 - C. spinning reserve
 - D. None of these

Ans. A

Sol. Cold reserve: It is that reserve generating capacity which isn't in operation but can be made available for service.

Hot reserve: It is that reserve generating capacity which in in operation but not is service.

Which is connected to the bus and is ready to take the load.

Spinning reserve: It is that reserve generating capacity which is connected to the bus and is ready to take the load.

43. Leakage factor in magnetic circuit is defined as:
- A. total flux + useful flux
 - B. total flux × useful flux
 - C. useful flux / total flux
 - D. total flux / useful flux

Ans. D

Sol. The total magnetic flux in an electric rotating machine or transformer divided by the useful flux that passes through the armature or secondary winding.

44. A 100/5 A bar primary current transformer supplies an overcurrent relay set at 25% pick up and it has a burden of 5 VA. The secondary voltage is
- A. 1 V
 - B. 1.25 V
 - C. 2.5 V
 - D. 4 V

Ans. D

Sol. Secondary side current = $5 \times \frac{25}{100}$

$$I_2 = \frac{5}{4} A$$

$$V_2 I_2 = 5$$

$$\text{Secondary voltage } (V_2) = \frac{5}{\frac{5}{4}}$$

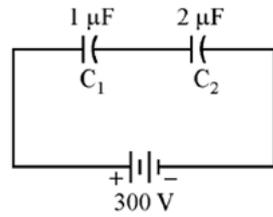
$$V_2 = 5 \times \frac{4}{5} = 4 V$$

45. Cheapest system of wiring is
- A. casing and capping
 - B. cleat wiring
 - C. batten wiring
 - D. conduit wiring

Ans. B

Sol. Cleat wiring is the cheapest wiring system. In Cleat wiring, when one circuit or cables are passing through another circuit or cable, then insulators are used on lower cables for safety purposes.

46. In the following figure, the voltage across C_1 will be



- A. 100 V
- B. 200 V
- C. 150 V
- D. 300 V

Ans. B

Sol.

$$V_{C_1} = V_s \times \frac{C_2}{C_1 + C_2} = 300 \times \frac{2 \mu F}{(2 + 1) \mu F} = \frac{300 \times 2}{3} = 200V$$

$$\therefore V_{C_1} = 200V$$

$$V_{C_2} = 100V.$$

47. What is/are the functions of SCADA?

- A. To monitor and gather data in real-time
- B. Information Storage and Reports
- C. To control manufacturing process virtually
- D. All of the above

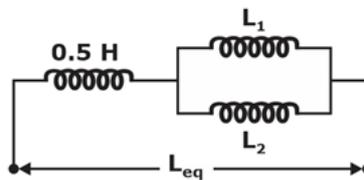
Ans. D

Sol. Functions of SCADA Systems:

We can tell the SCADA system is a collection of hardware and software components that allows the manufacturing units to perform specific functions. Some of the important functions include

- * To monitor and gather data in real-time
- * To interact with field devices and control stations via Human Machine Interface (HMI)
- * To record systems events into a log file
- * To control manufacturing process virtually
- * Information Storage and Reports

48. In the given circuit, inductances L_1 and L_2 , if $L_1 = 2L_2$ and L_{eq} is 0.7 H, are



- A. 0.4 H and 0.8 H respectively
- B. 0.6 H and 0.3 H respectively
- C. 0.8 H and 0.4 H respectively
- D. 1.0 H and 0.5 H respectively

Ans. B

Sol. $L_{eq} = 0.5 + \frac{L_1 L_2}{L_1 + L_2}$

Since, $L_1 = 2L_2$

$$L_{eq} = 0.5 + \frac{(2L_2)L_2}{(2L_2 + L_2)}$$

$$L_{eq} = 0.5 + \frac{2L_2^2}{3} = 0.7$$

$$\frac{2L_2^2}{3} = 0.2$$

$$L_2 = 0.3 \text{ and } L_1 = 0.6$$

49. The output of logic gate is 1 when all its inputs are 0. In such case the gate is either:
- A. AND gate or EX-OR gate
 - B. OR gate or EX-NOR gate
 - C. AND gate or OR gate
 - D. NOR gate or EX-NOR gate

Ans. D

Sol. If the output of logic gate is 1 when all inputs are at logic 0, then in such gate, logic gate is either NOR gate or EX-NOR gate. Consider the truth table as shown:

Input		Output	Input		Output
A	B	Y	A	B	Y
0	0	1	0	0	1
0	1	0	0	1	0
1	0	0	1	0	0
1	1	0	1	1	1

50. The deflecting torque of an Ammeter is directly proportional to the current passing through it and the instrument has full scale deflection of 90 degree for a current of 10 A. What deflection will occur for a current of 5 A. When the instrument has gravity control?
- A. 30 degree
 - B. 45 degree
 - C. 60 degree
 - D. 90 degree

Ans. A

Sol. For gravity control

$$T_d = I \sin \theta$$

$$I_1 \sin \theta_1 = I_2 \sin \theta_2$$

$$10 \sin 90 = 5 \sin \theta_2$$

$$\theta_2 = 30^\circ$$

51. In a power network, 380 kV is recorded at a 400 kV bus. A 60 MVAR, 400 kV bus. A 60 MVAR, 400 kV shunt reactor is connected to the bus. What is the reactive power absorbed by the shunt reactor?
- A. 57 MVAR
 - B. 54.15 MVAR
 - C. 66.48 MVAR
 - D. 63.16 MVAR

Ans. B

Sol. Reactive power absorbed by shunt reactor -

$$Q_{absorbed} = \frac{V^2}{X_{rated}}$$

$$Q_{absorbed} = \frac{(380)^2}{\frac{(400)^2}{60}}$$

$$Q_{absorbed} = \frac{380 \times 380 \times 60}{400 \times 400}$$

$$Q_{absorbed} = 54.15 \text{ MVAR}$$

52. Which of the following is an inverse transducer?
 A. Piezo electric crystals
 B. Resistance potentiometer
 C. Capacitive transducer
 D. L.V.D T

Ans. A

Sol.

The inverse transducer converts the electrical quantity into the non-electrical quantity. Examples of inverse transducer are Piezoelectric Transducer, current carrying conductor placed in a magnetic field.

53. In a 3 – phase induction motor the maximum torque
 A. is proportional to rotor resistance r_2 .
 B. does not depend on r_2 .
 C. is proportional to $\sqrt{r_2}$.
 D. is proportional to r_2^2 .

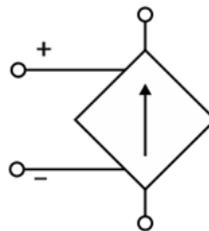
Ans. B

Sol. The maximum torque in a 3-φ induction motor

$$\Psi_{\max} = \frac{3}{W_s} \cdot \frac{V^2}{2X_2}$$

Does not depends upon the rotor resistance.

54. The symbol shown here is:



- A. Voltage controlled current source
 B. Current controlled current source
 C. Current controlled voltage source
 D. Voltage controlled voltage source

Ans. A

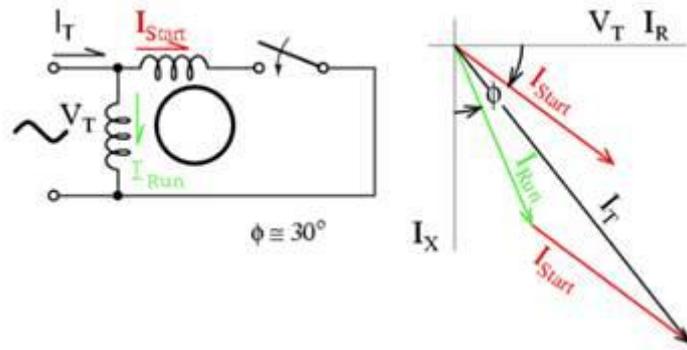
Sol. Direction symbol shows the source as current whereas the polarity across the source shows the controlling parameter as voltage.

55. At starting, the current through the starting winding (I_s) of single phase induction motor
 A. lags 'V' by 90°
 B. leads 'V' by 90°
 C. is nearly in phase with 'V'
 D. leads 'V' by 75°

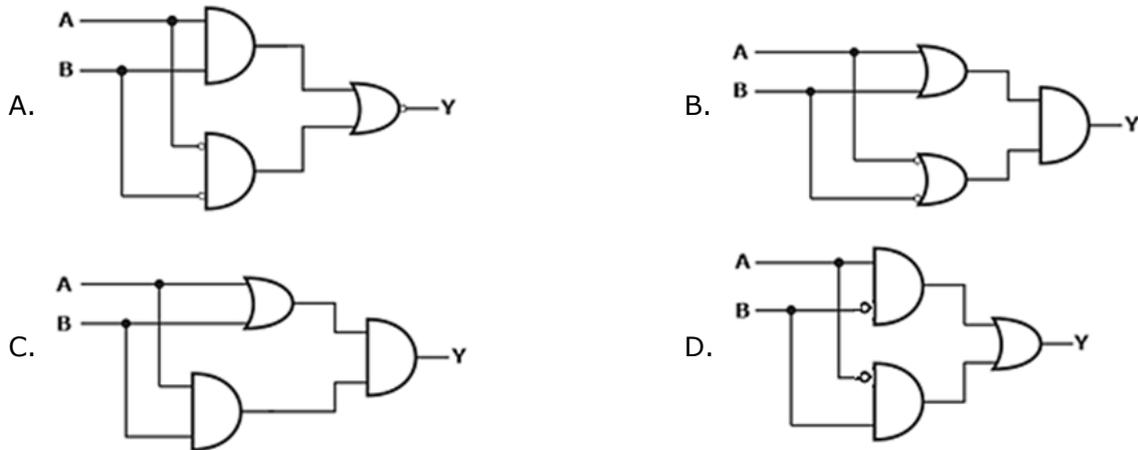
Ans. C

Sol. In addition to the main winding or running winding, the stator of single phase induction motor carries another winding called auxiliary winding or starting winding. A centrifugal switch is connected in series with auxiliary winding . The purpose of this switch is to disconnect the auxiliary winding from the main circuit when the motor attains a speed up to 75 to 80% of the synchronous speed. We know that the running winding is inductive in nature. Our aim is to create the phase difference between the two winding and this is possible if the starting winding carries high resistance so current is nearly in phase with voltage.

Let us say I_{run} is the current flowing through the main or running winding, I_{start} is the current flowing in starting winding, and V_T is the supply voltage.

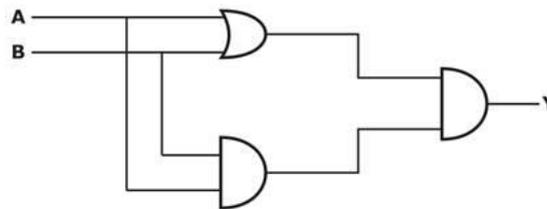


56. Which of the following logical circuit is not equivalent to an XOR gate?



Ans. C

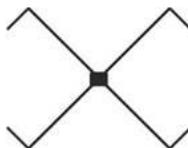
Sol. For option (C)



$$\begin{aligned}
 Y &= (A + B).AB \\
 &= ABA + ABB \\
 &= AB = \text{AND gate}
 \end{aligned}$$

And remain option simplifies to XOR gates.

57. The given symbol belongs to which of the following 'switch' and switch outlets?



- A. Two -way bell push
- B. Two-way switch
- C. Intermediate switch
- D. Two-pole one way switch

Ans. C

Ans. C

Sol. +26 is represented by: 11010

In 8-bit sign magnitude form, we have: 00011010

-26 is therefore given by:

⇒ (10011010)

61. The purpose of skewing of rotor slots in induction motor is_____.

- A. to increase the magnetic hum of the motor
- B. to increase the distribution factor
- C. to reduce the locking tendency of rotor
- D. to increase the breadth factor

Ans. C

Sol. In Squirrel cage rotor, slots in lamination or rotor core is not made parallel to the rotor shaft. A slight angle is maintained due to some advantages. This is called the rotor Skew. Skew helps to make the motor run quietly by reducing the magnetic hum. It reduce rotor locking tendency. Rotor locking tendency occurs when rotor teeth remain directly under stator teeth thus they might be magnetically attracted.

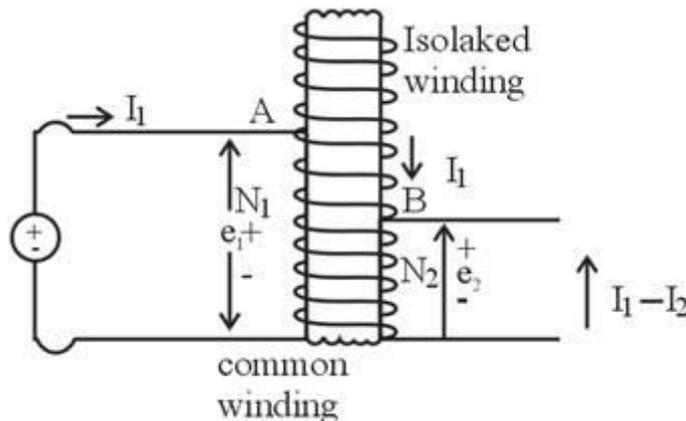
62. Consider the following statement regarding the auto transformer

- A) Volume of core requirement in auto transformer is less than two winding transformer.
 - B) In auto transformer the volume of copper requirement and insulation requirement is reduced.
- A. A is false but B is true.
 B. A is right but B is not the correct explanation of A
 C. A is true and B is false
 D. A is right and B is also right and B is the correct explanation of A.

Ans. B

Sol. Volume of core requirement is less in auto transformer than in two winding transformer because for given core area the requirement of copper and insulation is reduced.

(Volume of copper requirement)_{2 winding} = $N_1 I_1 + N_2 I_2 = 2NI$ (equal AT)



(volume of copper requirement)_{auto} = $I_1(N_1 - N_2) + (I_2 - I_1)N_2 = 2I_1(N_1 - N_2)$

= 2IN (value of **N**effective is reduced so requirement of insulation also reduced).

63. A stepper motor is
- A. a dc motor.
 - B. a single-phase ac motor.
 - C. a multi-phase motor.
 - D. a two phase motor.

Ans. D

Sol. A stepper motor is a two phase motor. It is a brushless DC electric motor that divides a full rotation into a number of equal steps.

Stepper motor works on 1-phase-ON or 2-phase –ON modes of operation

64. The losses in electric drive systems is/are
- A. Electrical Transmission Losses
 - B. Mechanical Transmission Losses
 - C. Load Losses
 - D. All of the above

Ans. D

Sol. LOSSES IN AN ELECTRICAL DRIVE SYSTEM

Energy conservation in an electrical drive is achieved by the reduction of losses in its various parts. Typical losses include the following:

- Electrical transmission losses: These losses depend on the drive power factor and harmonics in the line current.
- Conversion losses in the power modulator (or converter): The semiconductor converter usually has low conversion losses.
- Electric motor losses to convert electric power into mechanical power: These are determined by choice of the motor (quality of its design and selection of right rating) and quality of supply (voltage variations, unbalance, frequency variations and harmonics).
- Mechanical losses:- It is part of the transmission system such as bearings, gears, clutches, and belts.
- Losses in the load: A load in a machine required to perform a specified task such as fan, pump, and train.

65. Fleming Right Hand Rule is used to determine:-
- A. Direction of Induced EMF in Motoring Action.
 - B. Direction of Induced EMF in Generation Action.
 - C. Both (A) & (B)
 - D. Fleming Right hand Rule is not associated with Voltage/Current.

Ans. B

Sol. This rule is used to determine the direction of Induced EMF for generating action.

66. The minimum number of NAND gates required to implement the below function is?

$$F = A(A + B)(A + B + C)$$

- A. 1
- B. 0
- C. 2
- D. 3

Ans. B

Sol. The given function can be simplified as below:

$$F = A(A + B(B + C))$$

$$F = A(A + B + BC)$$

$$F = A + AB + ABC$$

$$\Rightarrow F = A(1 + B + BC)$$

$$\Rightarrow F = A$$

So, no gate is required to implement this function.

67. A 3 Phase, 11 kV, 5 MVA alternator has synchronous reactance of 10Ω per phase. Its excitation is such that the generated emf is 14 kV. If the alternator is connected to infinite bus the maximum output of the alternator at a given excitation is
- | | |
|-------------|------------|
| A. 15400 kW | B. 8000 kW |
| C. 6200 kW | D. 5135 kW |

Ans. A

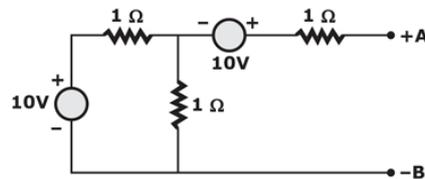
Sol. Maximum output power -

$$P_{max} = \frac{E_f v_t}{X_s}$$

$$P_{max} = \frac{14 \times 1000 \times 11 \times 1000}{10}$$

$$P_{max} = 15400 \text{ kW}$$

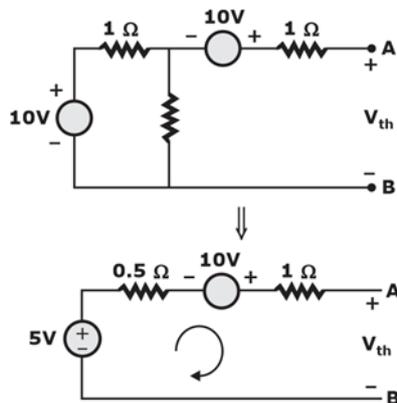
68. In the given circuit, Thevenin voltage across the terminal AB is



- | | |
|----------|---------|
| A. -15 V | B. 15 V |
| C. 5 V | D. 0 V |

Ans. B

Sol.



$$= \sin^{-1} \left(\frac{580.8}{1452} \right)$$

$$\delta_0 = 23.6 \text{ (electrical)}$$

$$\text{So, limit} \rightarrow 180^\circ - 23.6^\circ = 156.4^\circ$$

$$= 23.6^\circ \text{ to } 156.4^\circ$$

72. If the value of α is 0.9, then the value of β is _____

- A. 0.1
- B. 900
- C. 90
- D. 9

Ans. D

Sol.

$$\beta = \frac{\alpha}{1-\alpha} = \frac{0.9}{1-0.9} = 9$$

73. A permanent magnet moving coil ammeter has a coil resistance of 99 ohm and Full Scale Deflection (FSD) current of 0.1mA. Shunt resistance is 1 ohm. Current through the meter at 0.5 F.S.D is:

- A. 0.007mA
- B. 0.05mA
- C. 0.023mA
- D. None of these

Ans. B

Sol. Deflection produced in ammeter is directly proportional to the amount of current flowing through it.

$$\text{Hence, } [1 \text{ FSD} / 0.5 \text{ FSD}] = [0.1 \text{ mA}/x]$$

$$x = 0.05 \text{ mA}$$

74. What is the TUF of the center-tap full-wave rectifier?

- A. 28.6 %
- B. 57.3%
- C. 69.3%
- D. 81.2%

Ans. C

Sol.

$$TUF = \frac{(TUF)_p + (TUF)_s}{2} \text{ primary}$$

$$\text{Also } TUF = \frac{P_{DC}}{P_{AC}}$$

$$(TUF)_p = \frac{I_{DC}^2 R_L}{V_{RMS} I_{RMS}} = \frac{(2im) R_L}{\frac{i_m^2 R_L}{2}} = 81.2\%$$

$$(TUF)_s = \frac{P_{DC}}{P_{acs_1} + P_{acs_2}} = 57.3\%$$

$$TUF = \frac{81.2 + 57.3}{2} = 69.3\%$$

75. Inverter circuits are used in which of the following applications?
- A. UPS
B. Both A and C
C. As active filters
D. None of the above

Ans. B

Sol. Inverter circuits are used in

- (1) Ups (constant voltage and constant frequency type).
- (2) Speed control of AC motors (Variable voltage and variable frequency type).
- (3) Reactive power compensation.
- (4) Stability Enhancement in power systems.
- (5) As active filters.
- (6) In solar power converters and in the power converters of wind turbines.

76. What is the point on the surface closest to the focus point of an earthquake called?
- A. Hypercentre
B. Hypocentre
C. Epicentre
D. Circumcentre

Ans. C

Sol. • The **epicenter** is the point on the earth's surface **vertically** above the **hypocentre** (or focus) of an earthquake. It is the **first point** on the surface to experience the earthquake waves.

• The point where the **energy** is released is called the **focus** of an earthquake. This point is also called **hypocentre**. It is the point within the **earth** where an **earthquake rupture** starts.

77. Aral Sea lies between which two countries?
- A. Kazakhstan and Uzbekistan
B. Uzbekistan and Russia
C. Turkmenistan and Tazakhstan
D. Russia and Turkmenistan

Ans. A

Sol. * **Aral Sea** lies between **Kazakhstan and Uzbekistan**.

* By 1997, it had declined to 10% of its original size, splitting into four lakes:

* the North Aral Sea,

* the eastern and

* western basins of the once far larger South Aral Sea,

* and one smaller intermediate lake

* **Amu Darya and Syr Darya** Rivers feed this sea.

78. Which of the following states does not touch boundary of Assam?
- A. West Bengal
B. Arunachal Pradesh
C. Tripura
D. Sikkim

Ans. D

Sol. * Assam state does not share its border from Sikkim.

* Assam is bordered by West Bengal, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura and Meghalaya.

* Assam is known for Assam tea and Assam silk.

* Assam is house to popular Kaziranga National Park and Manas National Park.

83. Which of the following qualifications is not related to the governor?
- A. Must be citizen of India
 - B. Completed 38 years of age
 - C. Shall not be a member of both the houses of Parliament or of a Legislative Assembly or Legislative Council (if any)
 - D. Shall not hold office of profit

Ans. B

Sol. Under Article 158, the constitution lays down the following conditions for the Governor's office :-

- Must be citizen of India
- Completed 35 years of age
- Shall not be a member of both the houses of Parliament or of a Legislative Assembly or Legislative Council (if any)
- Shall not hold office of profit

84. Which of the following metals is liquid at a little greater than room temperature ?
- A. Lithium
 - B. Gallium
 - C. Sodium
 - D. Caesium

Ans. B

Sol. • **Gallium is liquid at a little greater than room temperature.**

- It is a **soft, silvery blue metal** at standard temperature and pressure.
- It is **predominantly used in electronics** and also used to **make alloys with low melting points.**
- It does not occur as a free element in nature.

85. Which of the isotopes of hydrogen is radioactive ?
- A. Protium
 - B. Deuterium
 - C. Tritium
 - D. None of Above

Ans. C

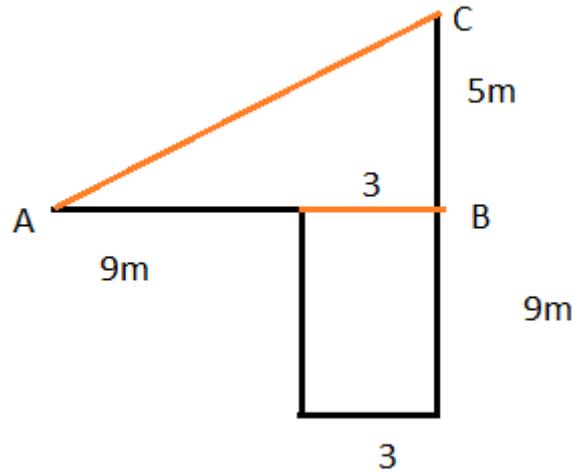
Sol. • **Tritium isotope of Hydrogen is radioactive.**

- It has a **half life of about 12.32 years.**
- Hydrogen is the only element whose isotopes have different names in common use today.

86. Puja started walking from his home. She walked 9 m from his home towards east and took right and walk 14 m. she then took left and walked 3 m again look left and walk 19 m and stopped at his office. Find the shortest distance between his home and his office?
- A. 14
 - B. 13
 - C. 15
 - D. 16

Ans. B

Sol.



Through Pythagoras theorem in triangle ABC , $AC = 13$,which is the shortest distance between his home and his office.

Hence, option B is the correct answer.

87. **Some equation are solved on the basis of certain system. On the same basis find out the correct answer for the unsolved equation:-**

$$12 \times 23 = 672, 11 \times 25 = 572, 16 \times 21 = ?$$

- A. 732
- B. 524
- C. 957
- D. 455

Ans. A

Sol. Logic: write the first number and second number in the reverse order then multiply.

$$12 \times 23 = 21 \times 32 = 672$$

$$11 \times 25 = 11 \times 52 = 572$$

$$16 \times 21 = 61 \times 12 = 732$$

Hence, option A is the correct answer.

88. Rahul is 9 ranks ahead of Shubham in a class of 41 if Shubham's rank is 12th from the last. What is Rahul rank from the start?

- A. 15
- B. 30
- C. 21
- D. 40

Ans. C

Sol. Shubham is 12th from the last and Rahul is 9 ranks ahead of Shubham. So, Rahul is 21st from the last.

$$\text{Number of the students ahead of Rahul in rank } (41 - 21) = 20$$

So, Rahul is 21th from the start.

Hence, option C is the correct answer.

89. **Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(S) from the statements.**

Statements:

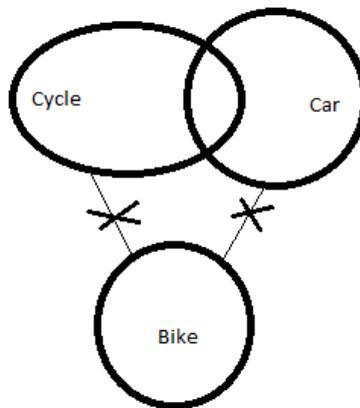
- No Cycle is Bike.
- No Bike is Car.
- Some Cycle is Car.

Conclusion:

- I. No car is Cycle.
- II. No car is bike.
- III. Some Cycle are bike.
- IV. All car are Bike.

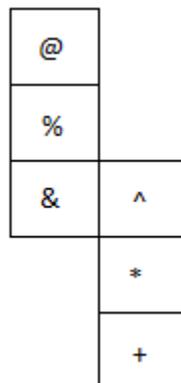
- A. None follows
- B. Only II follows
- C. Only II and III follows
- D. Only I and III follows

Ans. B
Sol.



NO car is Cycle. This is not true case so conclusion I does not follow.
NO car is bike. This is true case so conclusion II follows.
Some Cycle are bike. This is not true case so conclusion III does not follow.
All car are bike. This is not true case so conclusion IV does not follow.
Hence, option B is the correct answer.

90. **When the given figure is folded to form a cube then which face is opposite to the face with '*' ?**



- A. *
- B. ^
- C. %
- D. @

Ans. C

Sol. Here the opposite faces are as shown below:

@ - &

% - *

^ - +

Considering '*' as base thus the opposite face will be '%'.

Hence, option C is the correct answer.

91. **Select the set of letters that when sequentially placed in the blanks of the given letter series will complete the series.**

_qppq_pppq_qpppp_qqq

A. p, q, q, q

B. q, p, q, p

C. p, q, p, q

D. p, p, q, p

Ans. A

Sol. pq|ppq|pppq|pppp|qqq |

Number of letters keep on increasing in next pair

Hence, option A is the correct answer.

92. You are given a question and two statements. Identify which of the statements is/are necessary/sufficient to answer the question.

How many matches will be played during the tournament ?

Statements:

1). In a chess tournament each of Five players will play every other player exactly once.

2). Ruby plays the last game.

A. Statement 2 alone is sufficient

B. Statement 1 and 2 together are necessary

C. Statement 1 alone is sufficient

D. Statement 1 and 2 are not sufficient to solve

Ans. C

Sol. from statement 1:

required number of matches= $4+3+2+1=10$

so, Statement 1 alone is sufficient.

Statement 2 does not make any sense to reach the answer.

Hence, option C is the correct answer.

93. If YEARLY is coded as BFZZMS. What will be the code for ANNUAL?

A. OBOMBV

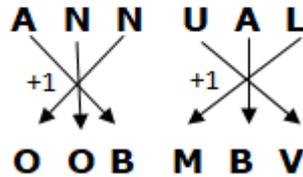
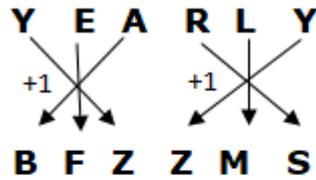
B. OOBMBV

C. OMMOBV

D. BOOVBM

Ans. B

Sol. The pattern is:



Hence, option B is the correct answer.

94. i. A,B,C,D,E and T standing in a row facing south.
 ii. E is third to right of A
 iii. C is fourth from one end of the row.
 iv. B who is in between A and D, is third to the Left of T.
 v. D is at the left end.

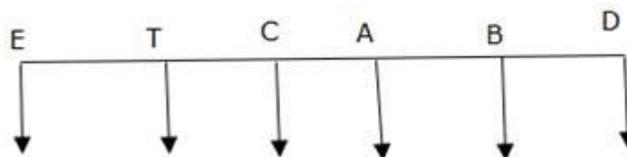
Which of the following is true?

- A. C is in between T and E
 B. C is second to the right of B
 C. E is immediate right of C
 D. A is immediate left of B

Ans. B

Sol. A is third to right of E. C is fourth from one end of the row. B who is in between A and D, is third to the Left of T. D is at the left end.

Final Arrangement is:



C is second to the right of B.

Hence, option B is the correct answer.

95. What will be the angle made between clock hands at 5:10 minute?
 A. 75°
 B. 95°
 C. 45°
 D. 65°

Ans. B

Sol. $30H - 11M \div 2$
 $= 30 \times 5 - 11 \times 10 \div 2$
 $= 150 - 55$
 $= 95^\circ$

Hence, option B is the correct answer.

96. धर्मांध शब्द में समास है।

- A. बहुव्रीहि समास
B. कर्मधारय समास
C. तत्पुरुष समास
D. द्वंद्व समास

Ans. C

Sol. समास - समास का तात्पर्य होता है - संछिप्तीकरण। इसका शाब्दिक अर्थ होता है छोटा रूप। अर्थात् जब दो या दो से अधिक शब्दों से मिलकर जो नया और छोटा शब्द बनता है उस शब्द को समास कहते हैं।

धर्मांध का समास विग्रह - धर्म में अंधा (तत्पुरुष समास)

तत्पुरुष समास - वह समास है जिसमें बाद का अथवा उत्तर पद प्रधान होता है तथा दोनों पदों के बीच का कारक-चिह्न लुप्त हो जाता है।

अधिकरण तत्पुरुष समास - अधिकरण कारक के चिह्न 'में' और 'पर' का लोप होता है ।

97. "कलेजा मुँह को आना" वाक्य में मुहावरे का सही अर्थ है?

- A. घबरा जाना
B. दुःखी होना
C. भाग जाना
D. हार जाना

Ans. A

Sol. मुहावरे - मुहावरे का शाब्दिक अर्थ होता है - अभ्यास। विशेष अर्थ को प्रकट करने वाले वाक्यांश को मुहावरा कहते हैं।

कलेजा मुँह को आना मुहावरे का अर्थ - घबरा जाना

अन्य विकल्प मुहावरे के लिए उपयोक्त नहीं हैं।

98. किस शब्द में 'कु' उपसर्ग नहीं है?

- A. कुरूप
B. कुशल
C. कुकर्म
D. कुचाल

Ans. B

Sol. 'कुशल' शब्द में 'कु' उपसर्ग नहीं है । जो शब्दांश शब्दों के आदि में जुड़ कर उनके अर्थ में कुछ विशेषता लाते हैं, वे उपसर्ग कहलाते हैं।

99. निम्न में से कौन सा शब्द वृद्धि संधि का उदाहरण नहीं है ?

- A. सदैव
B. जलौध
C. गुरूपदेश
D. परमौदार्य

Ans. C

Sol. गुरूपदेश में दीर्घ संधि है ।

100. "पुत्रशोक" शब्द का सही समास विग्रह क्या है?

- A. पुत्र का शोक
B. पुत्र के लिए शोक
C. पुत्र से होने वाला शोक
D. पुत्र से शोक

Ans. B

Sol. समास - समास का तात्पर्य होता है - संछिप्तीकरण। इसका शाब्दिक अर्थ होता है छोटा रूप। अर्थात् जब दो या दो से अधिक शब्दों से मिलकर जो नया और छोटा शब्द बनता है उस शब्द को समास कहते हैं।

पुत्रशोक शब्द का समास विग्रह - **पुत्र के लिए शोक**

तत्पुरुष समास - इस समास में दूसरा पद प्रधान होता है इसमें कर्ता और संबोधन कारक को छोड़कर शेष छः कारक चिन्हों का प्रयोग होता है जैसे - कर्म कारक, करण कारक, सम्प्रदान कारक, अपादान कारक, सम्बन्ध कारक, अधिकरण कारक।
