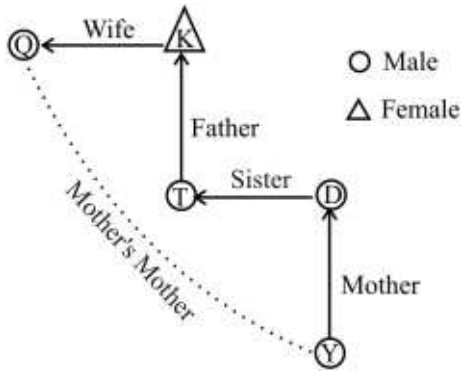
# SSC JE Electrical Engineering Online Exam 2024
# CPWD/CWC/MES
# Paper-I (Pre)

**Date: 07.06.2024** **Timing: 5:00 Pm-7:00 PM**

## General Intelligence and Reasoning

**1. In a certain code language**
**'A + B' means 'A is the wife of B',**
**'A − B' means 'A is the father of B',**
**'A × B' means 'A is the sister of B', and**
**'A ÷ B' means 'A is the mother of B'.**
**How is Q related to Y if 'Q + K − T × D ÷ Y'?**
(a) Father
(b) Father's father
(c) Mother's brother
(d) Mother's mother

**Ans. (d) :** According to the question, blood relation diagram is as follows -




Hence, from the above it is clear that Q is Mother's Mother of Y.

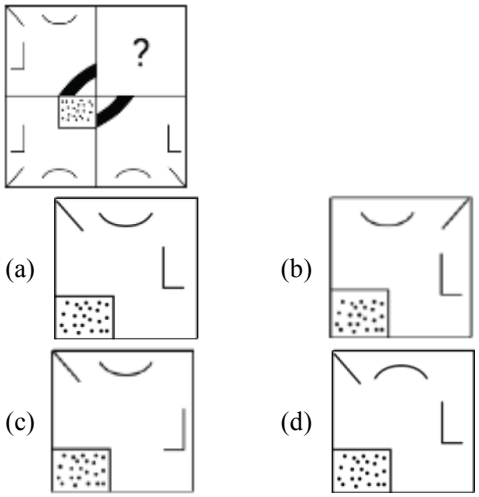
**2. What should come in place of the question mark (?) in the given series based on the English alphabetical order?**
**UTW, SRU, QPS, ONQ, MLO, ?**
(a) KJN
(b) LJM
(c) LKN
(d) KJM

**Ans. (d) :** The given, series is as follows-

U $\xrightarrow{-2}$ S $\xrightarrow{-2}$ Q $\xrightarrow{-2}$ O $\xrightarrow{-2}$ M $\xrightarrow{-2}$ K
T $\xrightarrow{-2}$ R $\xrightarrow{-2}$ P $\xrightarrow{-2}$ N $\xrightarrow{-2}$ L $\xrightarrow{-2}$ J
W $\xrightarrow{-2}$ U $\xrightarrow{-2}$ S $\xrightarrow{-2}$ Q $\xrightarrow{-2}$ O $\xrightarrow{-2}$ M

? = KJM

**3. Select the figure from the options that can replace the question mark (?) and complete the given pattern.**



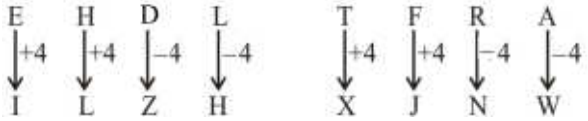

**Ans. (b) :** From the given question figure it is clear that option (b) will replace the question mark (?) and complete the pattern.

**4. Select the correct option that indicates the arrangement of the following words in a logical and meaningful order.**
**1. Cockroach**
**2. Owl**
**3. Ant**
**4. Horse**
**5. Fox**
(a) 3, 5, 4, 1, 2 (b) 3, 1, 2, 5, 4
(c) 3, 4, 1, 2, 5 (d) 3, 2, 5, 4, 1

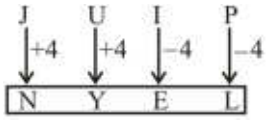
**Ans. (b) :** The logical and meaningful order of given words is as follows-
(3). Ant → (1). Cockroach → (2). Owl → (5). Fox → (4). Horse
Hence, option (b) will be correct.

**5. EHDL is related to ILZH in a certain way based on the English alphabetical order. In the same way, TFRA is related to XJNW. To which of the following is JUIP related, following the same logic?**
(a) NYEL (b) MZDK
(c) NZEK (d) MYDL

**Ans. (a) :** Just as, And



Same as,




**6. 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: All girls are honest. Priya is honest.**

**Conclusion 1: Priya is a girl.**

**Conclusion 2: All honest people are girls.**

(a) Only conclusion (1) follows
(b) Only conclusion (2) follows
(c) Both conclusion (1) and conclusion (2) follow
(d) None of the conclusions follow.

**Ans. (d) :** From the above statement it is clear that none of the conclusions follow.

**7. Six babies Ria, Sia, Tia, Urja, Vani and Winnie are born one after the other but not necessarily in the same order. All of them were born in different cities. Only two babies were born before the one who was born in Raipur. Only one baby was born between Sia, who was born in Delhi and the baby born in Raipur. Tia was born before Urja and just after the baby born in Haridwar. Tia was not born in Raipur. Ria was born in Bhopal and just before Vani. Tia is born immediately before the baby born in Ballia. Winnie was not born in Pune.**

**Who was born just after Sia and in which city?**

(a) Vani, Raipur (b) Urja, Raipur
(c) Tia, Pune (d) Ria, Bhopal

**Ans. (d) :** As per question,

| City | Baby |
|---|---|
| Delhi | Sia |
| Bhopal | Ria |
| Raipur | Vani |
| Haridwar | Winnie |
| Pune | Tia |
| Ballia | Urja |

Hence, From the above it is clear that 'Ria' was born in 'Bhopal' just after Sia.

**8. 18 is related to 162 following a certain logic. Following the same logic, 16 is related to 144. To which of the following is 25 related to following the same logic?**

**(NOTE: Operations should be performed on the whole numbers, without breaking down the numbers into its constituent digits. E.g. 13– Operations on 13 such as adding /subtracting /multiplying etc. Can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)**

(a) 215 (b) 225
(c) 235 (d) 245

**Ans. (b) :** Just as,

$18 \xrightarrow{\times 9} 162$

$16 \xrightarrow{\times 9} 144$

Same as,

$25 \xrightarrow{\times 9} \boxed{225}$

**9. Select the option in which the numbers share the same relationship as that shared by the given pairs of numbers.**

**100 : 90.**

**70 : 60**

**(NOTE: Operations should be performed on the whole number, without breaking down the numbers into its constituent digits. E.g. 13- Operations on 13 such as adding/subtracting/ multiplying etc. Can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is NOT allowed.)**

(a) 150 : 145 (b) 90 : 70
(c) 130 : 120 (d) 130 : 110

**Ans. (c) :** Just as

$100 : 90$

$\downarrow \quad \downarrow$

$10\times10 \ , \ 10\times(10-1)$

And

$70 : 60$

$\downarrow \quad \downarrow$

$10\times7 \ , \ 10\times(7-1)$

Same as, from option (c)

$130 : 120$

$\downarrow \quad \downarrow$

$10\times13 \ , \ 10\times(13-1)$

**10. Arrange the following words in which they appear in an English dictionary and select the correct option.**

**1. Helical**
**2. Helium**
**3. Heighten**
**4. Hellenic**
**5. Heiress**

(a) 41352 (b) 35124
(c) 53412 (d) 43152

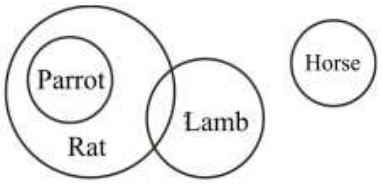
**Ans. (b) :** On arranging the given words according to English dictionary.
(3) Heighten, (5) Heiress, (1) Helical, (2) Helium, (4) Hellenic
Hence, 35124 is the required order.

**11.** **14 is related to 54 following a certain logic. Following the same logic, 9 is related to 24. To which of the following is 21 related following the same logic?**
**(NOTE: Operations should be performed on the whole numbers, without breaking down the numbers into their constituent digits. E.g. 13– Operations on 13 such as adding/subtracting /multiplying to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)**
(a) 96 (b) 90
(c) 89 (d) 99

**Ans. (a) :** Just as,
$14 \rightarrow 14 \times 6 - 30 = 54$
And
$9 \rightarrow 9 \times 6 - 30 = 24$
Similarly,
$21 \rightarrow 21 \times 6 - 30 = \boxed{96}$

**12.** **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:**
**All parrots are rats.**
**Some rats are lambs.**
**No lamb is a horse.**
**Conclusions:**
**(i) All rats are horses**
**(ii) Some lambs are parrots**
(a) Both conclusions (I) and (II) follow.
(b) Only conclusion (II) follows.
(c) Only conclusion (I) follows.
(d) Neither conclusion (I) nor (II) follows.

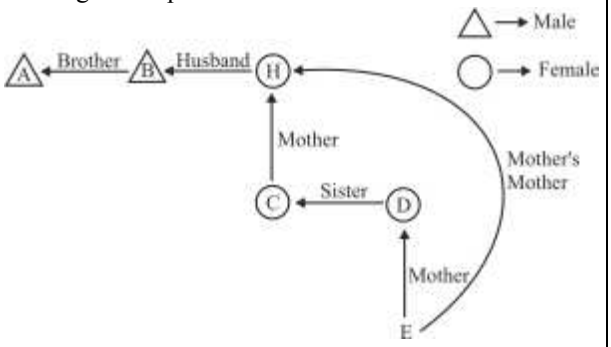
**Ans. (d) :** According to the statement the Venn diagram is as follows.




Hence, from the above it is clear that neither conclusion (i) nor (ii) follows.

**13.** **In a certain code language,**
**'A + B' means 'A is the mother of B'**
**'A – B' means 'A is the brother of B'**
**'A× B' means 'A is the sister of B' and**
**'A ÷ B' means A' is the husband of B'**
**How is H related to E if 'A – B ÷H + C × D + E ?**
(a) Daughter
(b) Mother
(c) Mother's sister
(d) Mother's mother

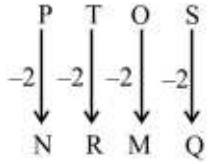
**Ans. (d) :** As per question, the blood relation diagram for the given expression is as follows-



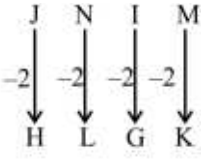

Hence, It is clear that H is 'Mother's Mother of E.

**14.** **PTOS is related to NRMQ in a certain way based on the English alphabetical order. In the same way, JNIM is related to HLGK. To which of the following is MQLP related, following the same logic?**
(a) OKJN
(b) KONJ
(c) KOJN
(d) OKNJ

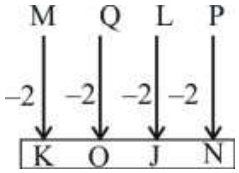
**Ans. (c) :** Just as,




And




Same as,




**15.** **The position(s) of how many letters will remain unchanged if each of the letters in the word HARDEST is arranged in the English alphabetical order?**
(a) Two (b) Three
(c) Zero (d) One

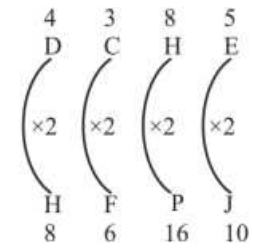
**Ans. (a) :** On arranging the letters of given words in English alphabetical order-

H A R D E S T
A D E H R S T

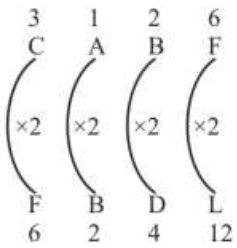
Hence, from the above it is clear that the position of 'Two' letters will remain unchanged.

**16.** **DCHE is related to HFPJ in a certain way based on the English alphabetical order. In the same way, CABF is related to FBDL. To which of the following is FIHE related, following the same logic?**
(a) PRLJ (b) PLRJ
(c) LRPJ (d) LPRG

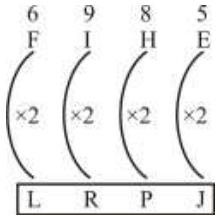
**Ans. (c) :** Just as,



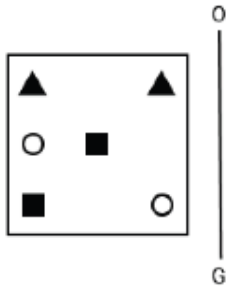

And

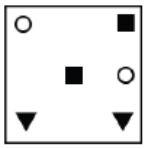


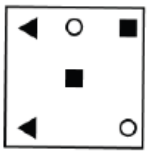

Same as,

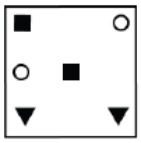


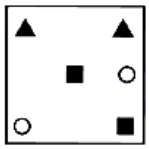

**17. Select the correct mirror image of the given figure when the mirror is placed at OG as shown below.**




(a) 

(b) 

(c) 

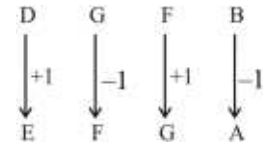
(d) 

**Ans. (d) :** Mirror image of the given question figure is option figure (d).

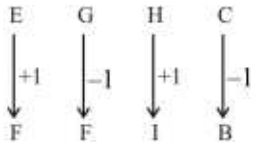
**18. DGFB is related to EFGA in a certain way based on the English alphabetical order. In the same way, EGHC is related to FFIB. To which of the following is FDHB related, following the same logic?**

(a) GCAS (b) GCIA
(c) GCAO (d) GCER

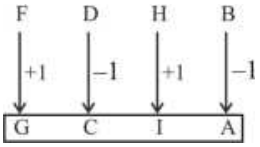
**Ans. (b) :** Just as,




And




Same as,




**19. What will come in the place of '?' in the following equation, if '+' and '–' are interchanged and '×' and '÷' are interchanged?**
**10 ÷ 8 × 4 – 6 + 2 = ?**

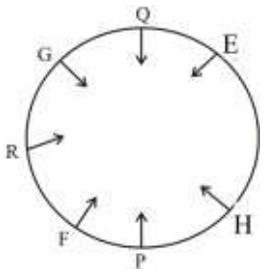
(a) 24 (b) 28
(c) 22 (d) 26

**Ans. (a) :** The given equation is-
10 ÷ 8 × 4 – 6 + 2
As per question, On interchanging the signs-
10 × 8 ÷ 4 + 6 – 2 = ?
= 10 × 2 + 6 – 2
= 20 + 6 – 2
= 26 – 2
= 24

**20. E, F, G, H, P, Q, and R, are sitting around a circular table facing the centre (not necessarily in the same order). Only three people sit between P and G when counted from the right of P. Only F sits between R and P when counted from the left of P. Only two people sit between R and E when counted from the left of R. H is NOT an immediate neighbor of G. How many people sit between F and Q when counted from the left of F?**

(a) Four (b) Three
(c) Two (d) One

**Ans. (c) :** According to the question, sitting arrangement is as follows-




Hence, On counting from left of F 'Two' people sits between F and Q.

**21. What should come in place of the question mark (?) in the given series based on the English alphabetical order?**
**LSC, NVG, PYK, RBO, ?**

(a) QDU (b) UGT
(c) WHI (d) TES

**Ans. (d) :** Given series is as follows-

L $\xrightarrow{+2}$ N $\xrightarrow{+2}$ P $\xrightarrow{+2}$ R $\xrightarrow{+2}$ T
S $\xrightarrow{+3}$ V $\xrightarrow{+3}$ Y $\xrightarrow{+3}$ B $\xrightarrow{+3}$ E
C $\xrightarrow{+4}$ G $\xrightarrow{+4}$ K $\xrightarrow{+4}$ O $\xrightarrow{+4}$ S

**22. What will come in place of the question mark (?) in the following equation if '+' and '×' are interchanged and '–' and '÷', interchanged ?**
**4 + 11 × 48 – 6 ÷ 3 = ?**
(a) 53 (b) 49
(c) 46 (d) 51

**Ans. (b) :** Given, equation is -
4 + 11 × 48 – 6 ÷ 3 = ?
According to the question on interchanging the signs.
4 × 11 + 48 ÷ 6 – 3 = ?
= 44 + 8 – 3
= 52 – 3
= 49

**23. What should come in place of the question mark (?) in the given series based on the English alphabetical order?**
**HKI, GLH, FMG, ENF, ?**
(a) CDE (b) POE
(c) DUE (d) DOE

**Ans. (d) :** Given series is as follows -

H $\xrightarrow{-1}$ G $\xrightarrow{-1}$ F $\xrightarrow{-1}$ E $\xrightarrow{-1}$ D
K $\xrightarrow{+1}$ L $\xrightarrow{+1}$ M $\xrightarrow{+1}$ N $\xrightarrow{+1}$ O
I $\xrightarrow{-1}$ H $\xrightarrow{-1}$ G $\xrightarrow{-1}$ F $\xrightarrow{-1}$ E

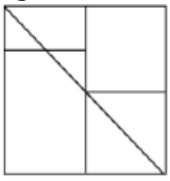
**24. What should come in place of the question mark (?) in the given series based on the English alphabetical order?**
**LOR, PSV, TWZ, XAD, BEH, ?**
(a) FJM (b) FIL
(c) GKL (d) EIM

**Ans. (b) :** The given series is as follows-

L $\xrightarrow{+4}$ P $\xrightarrow{+4}$ T $\xrightarrow{+4}$ X $\xrightarrow{+4}$ B $\xrightarrow{+4}$ F
O $\xrightarrow{+4}$ S $\xrightarrow{+4}$ W $\xrightarrow{+4}$ A $\xrightarrow{+4}$ E $\xrightarrow{+4}$ I
R $\xrightarrow{+4}$ V $\xrightarrow{+4}$ Z $\xrightarrow{+4}$ D $\xrightarrow{+4}$ H $\xrightarrow{+4}$ L

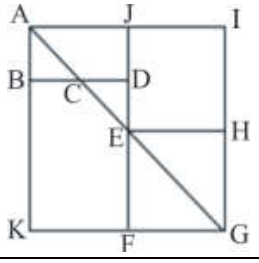
Hence ? = FIL

**25. How many triangles are there in the given figure?**



(a) 9 (b) 7
(c) 8 (d) 10

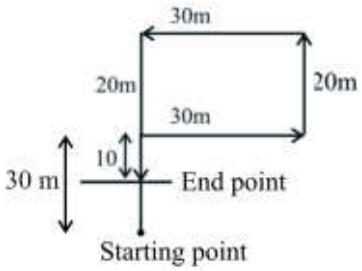
**Ans. (b) :** Given,




Triangles are → ABC, CDE, AJE, EFG, HEG, AGI, AKG
Hence the number of triangles = 7

**26. Sandeep starts walking towards the north from a point and walks 30 m. He turns to the right and walks 30 m. He turns to the left and walks 20 m. He turns to the left and walks 30 m. Finally, he turns to the left and walks 30 m. How far is he now from the starting point? (All turns are 90 degrees turns only unless specified.)**
(a) 10 m (b) 15 m
(c) 30 m (d) 20 m

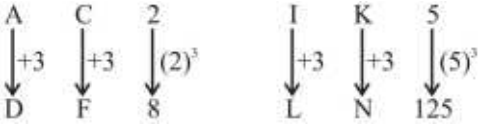
**Ans. (d) :** As per question, path of Sandeep is as follows



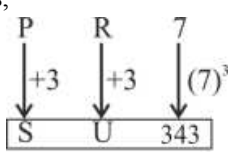

Hence, Sandeep is 20 m far from his starting point.

**27. 'AC 2' is related to 'DF 8' in a certain way based on the English alphabetical and numerical order. In the same way, 'IK 5' is related to 'LN 125'. To which of the following is 'PR 7' related following the same logic?**
(a) SU 216 (b) RU 343
(c) SU 343 (d) TU 216

**Ans. (c) :** Just as, And

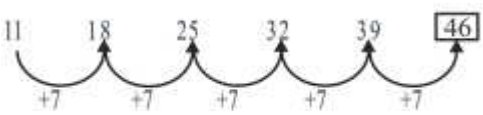



Same as,




**28. What should come in place of the question mark (?) in the given series?**
**11, 18, 25, 32, 39, ?**
(a) 44 (b) 45
(c) 43 (d) 46

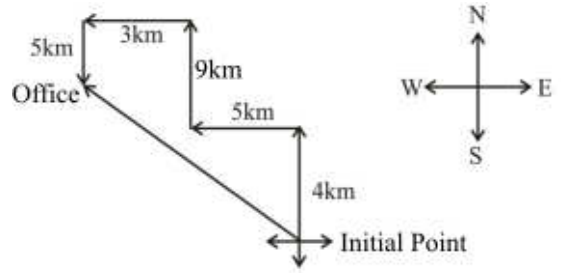
**Ans. (d) :** Given series is as follows -




Hence ? = 46

**29.** **Manoj starts from his home and drives 4 km towards the north. He then takes a left turn, drives 5 km, turns right, and drives 9 km. He then takes a left turn and drives 3 km and turns left then drives 5 km to reach his office. In which direction is the office with respect to his home?**
**(All turns are 90° turns only, unless specified.)**
(a) South-east (b) West
(c) North-east (d) North-west

**Ans. (d) :** As per question the path of Manoj is as follows -




Hence from the above it is clear that Manoj's office is to the north - west direction with respect to his home.

**30.** **Which two numbers should be interchanged to make the given equation correct?**
**(165 ÷ 3) + (135 ÷ 5) – 45 + 33 = 66**
**(Note: Interchange should be done of entire number and not individual digits of a given number)**
(a) 45 and 33 (b) 33 and 5
(c) 165 and 135 (d) 45 and 3

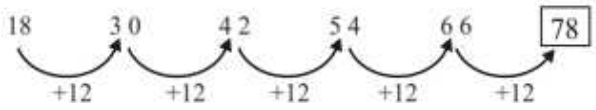
**Ans. (c) :** Given equation is -
(165 ÷ 3) + (135 ÷5) – 45 + 33 = 66
According to option (c), On interchanging the number 165 and 135.
(135 ÷ 3) + (165 ÷ 5) – 45 + 33 = 66
45 + 33 – 45 + 33 = 66
33 + 33 = 66
66 = 66
LHS = RHS

**31.** **Select the word-pair that best represents a similar relationship to the one expressed in the pair of words given below.**
**(The words must be considered as meaningful English words and must not be related to each other based on the number of letters/number of consonants/vowels in the word.)**
**Greece : Athens**
(a) Jordan : Tokyo
(b) Norway : Muscat
(c) Ireland : Dublin
(d) Indonesia : Tehran

**Ans. (c) :** Just as, Capital of 'Greece' is 'Athens' similarly capital of 'Ireland' is 'Dublin'.

**32.** **What should come in place of the question mark (?) in the given series?**
**18, 30, 42, 54, 66, ?**
(a) 70 (b) 73
(c) 82 (d) 78

**Ans. (d) :** Given, series is as follows -




Hence, ? = 78

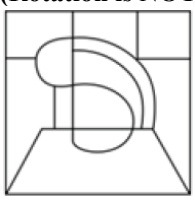
**33.** **The position(s) of how many letters will remain unchanged if each of the letters in the word ABSOLUTE is arranged in the reverse of the English alphabetical order?**
(a) One (b) Two
(c) Three (d) Four

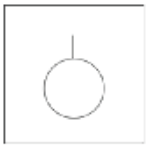
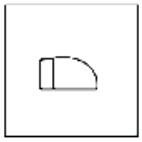
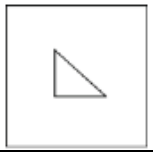
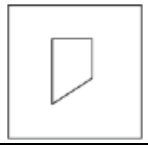
**Ans. (c) :** On arranging the letters of given word in the reverse of english alphabetical order-

| A | B | S | O | L | U | T | E |
|---|---|---|---|---|---|---|---|
| U | T | S | O | L | E | B | A |

Hence, it is clear that the position of 'three' letters will remain unchanged.

**34.** **Select the figure that is embedded as a part of the main figure (X).**
**(Rotation is NOT allowed.)**

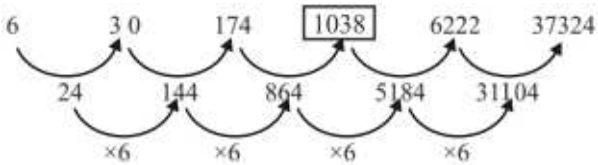


(a) 
(b) 
(c) 
(d) 

**Ans. (b) :** Figure given in option (b) is embedded as a part of the main figure (X).

**35.** **What should come in place of ? in the given series?**
**6, 30, 174, ?, 6222, 37326**
(a) 1098 (b) 1038
(c) 1008 (d) 1058

**Ans. (b) :** Given, Series is as follows-



**36.** **This question consists of a pair of words which have a certain relationship to each other. Select the pair which has the same relationship.**
**(The words must be considered as meaningful English words and must not be related to each other based on the number of letters/number of consonants/vowels in the word.)**
**Brazil : Real**
(a) Cuba : Euro (b) Kenya : Yen
(c) Indonesia : Rial (d) Malaysia : Ringgit

**Ans. (d) :** Just as, Currency of Brazil is 'Real' Similarly Currency of Malaysia is 'Ringgit'.

**37.** **In a certain code language, 'GROW' is coded as '5397' and 'WILD' is coded as '6942'. What is the code for 'W' in the given code language?**
(a) 9 (b) 2
(c) 6 (d) 7

**Ans. (a) :** Given,
G R O (W) → 5 3 (9) 7
(W) I L D → 6 (9) 4 2
Hence it is clear that the code for 'W' is '9'.

**38.** **If A means +, B means −, C means × and D means ÷, then what will come in place of the question mark (?) in the following equation?**
**21 D 7 C 4 A 10 B 13 = ?**
(a) 10 (b) 8
(c) 9 (d) 11

**Ans. (c) :** Given,
21 D 7 C 4 A 10 B 13 = ?
According to the question on substituting the signs in the given equation.
$\Rightarrow$ 21 ÷ 7 × 4 + 10 – 13 = ?
$\Rightarrow$ 3 × 4 + 10 – 13 = ?
$\Rightarrow$ 12 + 10 – 13 = ?
$\Rightarrow$ 9 = ?

**39.** **2 is related to 26 following a certain logic. Following the same logic, 4 is related to 52. To which of the following is 7 related following the same logic?**
**(NOTE: Operations should be performed on the whole numbers, without breaking down the numbers into its constituent digits. E.g. 13– Operations on 13 such as adding /subtracting /multiplying etc. Can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)**
(a) 25 (b) 27
(c) 72 (d) 91

**Ans. (d) :** Just as,
$2 \xrightarrow{\times 13} 26$
And $4 \xrightarrow{\times 13} 52$
Same as, $7 \xrightarrow{\times 13} 91$

**40.** **In a certain code language, 'HOPE' is coded as '7395' and 'OURS' is coded as '6582'. What is the code for 'O' in the given code language?**
(a) 9 (b) 16
(c) 5 (d) 7

**Ans. (c) :** Given,
H (O) P E → 7 3 9 (5)
(O) U R S → 6 (5) 8 2
Hence, the code for 'O' in the given Code language is '5'.

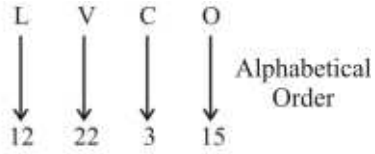
**41.** **Select the correct mirror image of the given figure when the mirror is placed at MN as shown below.**


(a) Z p ʍ ⊁ M (b) S b w ⊁ M
(c) S b w ⊁ W (d) d 2 w ⊁ M

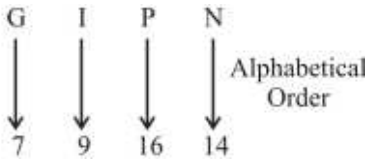
**Ans. (b) :** As per question,
Figure given in option (b) will be the mirror image of question figure.

**42.** **In a certain code language, 'LVCO' is coded as '12-22-3-15' and 'GIPN' is coded as '7-9-16-14'. What is the code for 'ZAPG' in the given language?**
(a) 22-5-15-6 (b) 22-2-11-5
(c) 24-5-14-8 (d) 26-1-16-7

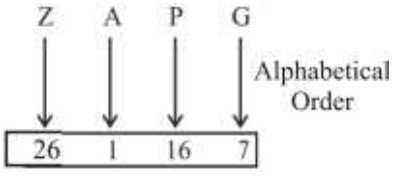
**Ans. (d) :** Just as,




And



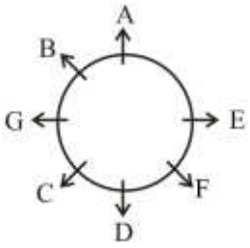

Same as,




**43.** **A, B, C, D, E, F, and G are sitting around a circular table, facing away from the centre (not necessarily in the same order). Only 3 people sit between B and D when counted from the left**

**of D. B sits second to the left of E. G sits to the immediate right of C. A is not an immediate neighbor of D.**
**Who is sitting to the immediate right of E?**
(a) F (b) D
(c) A (d) B

**Ans. (a) :** According to the question Sitting arrangement is as follows-




Hence, from the above it is clear that 'F' is sitting to the immediate right of E.

**44. What should come in place of the question mark (?) in the given series based on the English alphabetical order?**
**MOK, LNJ, KMI, JLH, ?**
(a) HJG (b) HPJ
(c) IKG (d) IKH

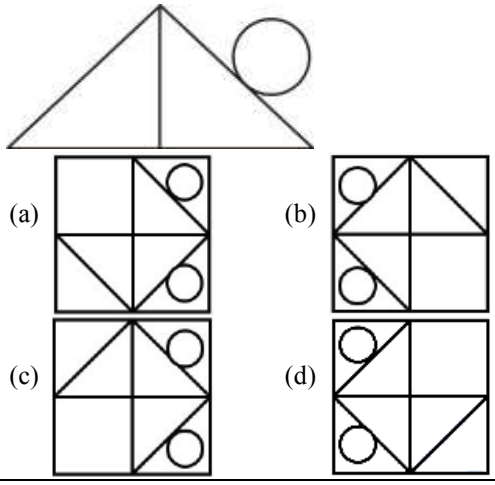
**Ans. (c) :** Given,

$M \xrightarrow{-1} L \xrightarrow{-1} K \xrightarrow{-1} J \xrightarrow{-1} \boxed{I}$
$O \xrightarrow{-1} N \xrightarrow{-1} M \xrightarrow{-1} L \xrightarrow{-1} \boxed{K}$
$K \xrightarrow{-1} J \xrightarrow{-1} I \xrightarrow{-1} H \xrightarrow{-1} \boxed{G}$

**45. Select the triad in which the numbers are related to each other in the same way as are the numbers of the given triads.**
**(NOTE: Operations should be performed on the whole numbers, without breaking down the numbers into its constituent digits. E.g. 13– Operations on 13 such as adding/deleting/ multiplying etc. Can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)**
**(12, 9, 96)**
**(14, 7, 84)**
(a) (17, 12, 170) (b) (10, 12, 120)
(c) (15, 8, 130) (d) (18, 11, 180)

**Ans. (d) :** Just as,
(12, 9, 96)
$12 \times (9 - 1) = 96$
And (14, 7, 84)
$14 \times (7-1) = 84$
Same as, from option (d)-
(18, 11, 180)
$18 \times (11-1) = 180$

**46. Select the option in which the given figure is embedded (rotation is NOT allowed).**




**Ans. (c) :** The given question figure is embedded in option figure (c).

**47. What should come in place of the question mark (?) in the given series based on the English alphabetical order?**
**FIK, GJL, HKM, ILN, ?**
(a) OMJ (b) JMO
(c) JOM (d) OJM

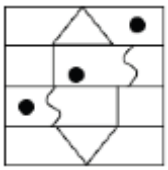
**Ans. (b) :** The given series is as follows-

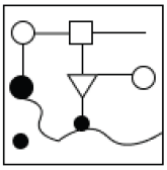
$F \xrightarrow{+1} G \xrightarrow{+1} H \xrightarrow{+1} I \xrightarrow{+1} \boxed{J}$
$I \xrightarrow{+1} J \xrightarrow{+1} K \xrightarrow{+1} L \xrightarrow{+1} \boxed{M}$
$K \xrightarrow{+1} L \xrightarrow{+1} M \xrightarrow{+1} N \xrightarrow{+1} \boxed{O}$

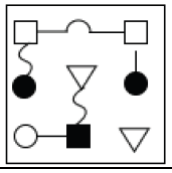
**48. Select the set in which the numbers are related in the same way as are the numbers of the following sets.**
**(NOTE : Operations should be performed on the whole numbers, without breaking down the numbers into its constituent digits. E.g. 13– Operations on 13 such as adding /subtracting/ multiplying etc. Can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed)**
**(9, 100, 90)**
**(11, 120, 110)**
(a) (12, 130, 120) (b) (13, 260, 130)
(c) (14, 164, 154) (d) (15, 130, 120)

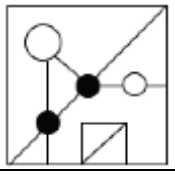
**Ans. (a) :** Just as,
(9, 100, 90)
$9 \times 10 = 90$ (Last term)
$9 \times 10 + 10 = 100$ (Middle term)
And (11, 120, 110)
$11 \times 10 = 110$ (Last term)
$11 \times 10 + 10 = 120$ (Middle term)
Similarly (12, 130, 120)
$12 \times 10 = 120$ (Last term)
$12 \times 10 + 10 = 130$ (Middle term)

**49. Select the option figure in which the given figure is embedded as its part (rotation is NOT allowed).**

(a) 

(b) 

(c) 

(d) 

**Ans. (b) :** The given question figure is embedded in option figure (b) as its part.

**50. In a certain code language, 'CASE' is coded as '8426' and 'SLIP' is coded as '9275'. What is the code for 'S' in the given language?**

(a) 8 (b) 6
(c) 2 (d) 9

**Ans. (c) :** Given,

C A Ⓢ E → 8 4 ② 6

Ⓢ L I P → 9 ② 7 5

Hence, the code for 'S' in the given language is '2'.

## General Awareness

**1. Which ministry introduced the Press and Registration of Periodicals (PRP) Bill in Rajya Sabha on 1 August 2023?**

(a) Ministry of Electronics and Information Technology
(b) Ministry of Commerce and Industry
(c) Ministry of Information and Broadcasting
(d) Ministry of Corporate Affairs

**Ans. (c) :** The newspaper Registration Bill - 2023 was introduced in the Rajya Sabha by the ministry of Information and Broadcasting on 1st August 2023. This bill was also passed by the Loksabha on 21 Dec which will repeat the already existing Book registration Act 1867. There is a provision for registration of magazines in the bill, While books are kept out of this bill Apart been brought by this bill.

**2. Why is it safer for our hands to use a wooden spoon while cooking in a hot pan instead of using a metallic spoon?**

(a) Wood is a good conductor of heat and helps in cooking
(b) Wood adds nice flavours to the food being cooked
(c) Wood is an insulator and does not heat up
(d) Wood helps the food cook faster

**Ans. (c) :** It is safer for our hands to used a wooden spoon while cooking in a hot pan instead of using a metallic spoon because wood is a bad conductor of heat and does not get heated easily as compared to metallic spoon.

**3. It is hot outside. It is cloudy and raining most of the time. It is the month of June. Which season is it?**

(a) Winter
(b) Summer
(c) Monsoon
(d) Spring

**Ans. (c) :** It is hot outside. It is cloudy and raining most of the time. It is the month of June. It is monsoon season. During monsoon, it is cloudy most of the time and due to humidity outside, there is sultry heat. In India this occurs from the middle of June. Monsoon season in India lasts from June to September.

**4. Who was sworn in as the Governor of Andhra Pradesh on 24 February 2023?**

(a) Pratap Shukla
(b) S. Abdul Nazeer
(c) Gulab Chand Kataria
(d) Acharya Dev Vrat

**Ans. (b) :** On February 24, 2023, S. Abdul Nazir sworn in as the Governor of Andhra Pradesh: He is also Currently Working on the post of Governor. The Governor is appointed by the president under Article 155 of the constitution.

**5. Which of the following is the domestic first-class cricket championship in India?**

(a) Santosh Trophy
(b) Thomas Cup
(c) Ranji Trophy
(d) Durand Cup

**Ans. (c) :** Ranji Trophy is India's domestic first class cricket championship organized annually by BCCI. It was started in 1934 by the BCCI as India's first national level cricket tournament Earlier this competition was called as. The cricket Championship of India. It got its current name, the Ranji Trophy so as to honour kumar Shri Ranjitsinhji who was the first Indian to play international cricket.

**6. Who among the following became the first woman Chief Executive and Chairperson of the Railway Board on 1 September 2023?**

(a) Maria Kalavathy
(b) Surekha Bhosale
(c) Jaya Varma Sinha
(d) Kabitha Mathur

**Ans. (c) :** Jaya verma Sinha become the first woman chief executive and Chairperson of the Railway Board on 1 September 2023. Jaya Verma Sinha is the first woman to be appointed to this top post in Indian Railways.

**7. Who among the following eminent musicians is a famous tabla player?**

(a) Ustad Moinuddin Khan
(b) Ustad Bade Gulam Ali Khan
(c) Ustad Zakir Hussain
(d) Ustad Abdul Rashid Khan

**Ans. (c) :** Ustad Zakir Hussain is a noted and renowned tabla player. Ustad Zakir Hussain is considered as one of the most important personalities in shaping the contemporary world music movement He is often credited for taking the table to the world stage.

**8. Where is the headquarters of the National Remote Sensing Centre (NRSC)?**

(a) Bhopal
(b) Bhubaneshwar
(c) Hyderabad
(d) Lucknow

**Ans. (c) :** National Remote sensing center (NRSC ) at Hyderabad is responsible for remote sensing satellite data acquisition and processing data, dissemination, aerial remote sensing and decision support for disaster management.

**9. The 42nd Constitutional Amendment Act (1976) added three new words to the Preamble i.e. socialist, secular and _____.**

(a) republic (b) integrity
(c) democratic (d) integrity

**Ans. (b) :** By the 42nd constitutional Amendment 1976, there new words socialist, secular, and integrity were added to the Indian constitution. It is noteworthy that the 42nd constitution is also known as the mini constitution.

**10. Rank the following states in descending order of their percentage share of the population in the country's population, as per Census 2011.**
**Bihar, West- Bengal, Rajasthan, Madhya Pradesh**

(a) Rajasthan - Madhya Pradesh-Bihar-West Bengal
(b) Madhya Pradesh-Bihar-Rajasthan-West Bengal
(c) Bihar-West Bengal-Madhya Pradesh-Rajasthan
(d) Bihar-Madhya Pradesh-Rajasthan-West Bengal

**Ans. (c) :** Ranking of the following states in descending order of the population in the country's population, as per census 2011 is as follows.
Bihar, west Bengal, Madhya Pradesh, Rajasthan.

**11. Which sulphur containing preservative is used to increase the shelf life of meat products such as fresh sausages and burgers?**

(a) Sodium metabisulphite
(b) Sodium polysulfides
(c) Sodium thiosulfate
(d) Sodium phenyl sulfide

**Ans. (a) :** Sodium metabisulphite preservative is used to increase the shelf life of meat products such form of a white crystalline powder and when mixed with water acts as a corrosive acid. Food preservative and laboratory reagent.

**12. In how many different combinations do the standard ASCII codes come?**

(a) 128 (b) 100
(c) 64 (d) 256

**Ans. (a) :** The standard ASCII code (American standard code for Information Interchange) is a 7 bit character set consisting of 128 characters. It holds numbers from 0- 9 and the upper & lower case English characters from A - Z and some special characters. HTML in modern computers and all Characters sets used on the internet are based on ASCII.

**13. According to Census of India 2011, which is the second most populated state?**

(a) Bihar
(b) Tamil Nadu
(c) Maharashtra
(d) Rajasthan

**Ans. (c) :** According to the census of India 2011 , the states with the highest population are as follows, Uttar Pradesh, Maharashtra, Bihar, West Bengal and Madhya Pradesh respectively. Where as in terms of Area, the largest state is Rajasthan and the smallest state is Goa. In terms population, the largest state is Uttar Pradesh and the smallest sate is Sikkim.

**14. How does the 'Shram Suvidha Portal' of the Ministry of Labour and Employment contribute to transparency in labour law enforcement?**

(a) By providing child care centres
(b) By allowing women to work night shifts/
(c) By uploading inspection reports within 48 hours
(d) By ensuring minimum wages for all employees

**Ans. (c) :** The inspection report is uploaded with in 48 hours on the shram suvidha Portal of the ministry of Labour and employment to ensure transparency in labour law enforcement. Shram Suvidha Portal has been developed to facilitate the reporting of inspections and submission of returns.

**15. Identify the incorrect pair (River and its origin) from the following.**

(a) Narmada - Amarkantak hills
(b) Krishna - Brahmagri range
(c) Godavari - Nasik district
(d) Tapi - Satpura ranges

**Ans. (b):** Krishna River Originates near Mahabaleshwar (Satara) in the state of Maharashtra. It is the second longest river of Peninsular of India after Godavari River. It's tributaries include Tungabhadra, Mallaprabha, Kotana, Mima, Ghatprabha, Yerla, Varnakh dundi etc.

16. **Which is the correct formula to calculate the formula unit mass of a compound?**
(a) Multiplication of all the atomic masses of all the atoms within the formula
(b) Summation of all the atomic weights of all the atoms within the formula
(c) Summation of all the atomic masses of all the atoms within the formula
(d) Multiplication of all the atomic weights of all the atoms within the formula

**Ans. (c) :** To calculate the unit mass of a compound, the formula contains the sum of all the atomic masses of all the atoms. The term action unit is used for substances that are composed of ions.

17. **According to Census of India 2011, which state/union territory has the second highest sex ratio?**
(a) Chandigarh (b) Tamil Nadu
(c) Puducherry (d) Himachal Pradesh

**Ans. (c) :** According to the 2011 census the top five union territories /sates with sex ratio are - Kerala (1084) Puducherry, (1037), Tamil Nadu (996), Andhra Pradesh (993), Chhattisgarh (991), Where as the union territory with the highest sex ratio is Puducherry (1038) and the Union territory with the lowest sex ratio is Daman and Diu (618). The state lowest sex ratio among the states is Haryana.

18. **Which organelle contains enzymes that help break down fatty acids and detoxify certain compounds in the cell?**
(a) Vacuole (b) Centriole
(c) Lysosome (d) Peroxisome

**Ans. (d) :** Peroxisomes are small round. Organelles enclosed by single membranes. They carry aut of oxidation reactions that break down fatty acid and amine acid. They also detoxify many passions that may enter the body.

19. **Which of the following is a popular email client software?**
(a) Microsoft Word
(b) Adobe Photoshop
(c) Mozilla Firefox
(d) Microsoft Outlook

**Ans. (d) :** Microsoft outlook is a popular e- mail client software. While Mozilla fire fox is a search engine, Adobe Photoshop is image editing software.

20. **_____, a woman educated at home at Poona, published a book, Stripurushtulna, criticizing the social differences between men and women.**
(a) Savitribai Phule (b) Kadambini Devi
(c) Pandita Ramabai (d) Tarabai Shinde

**Ans. (d) :** Tarabai Shinde, a woman educated at home at poona, published a book, stripurushtulna criticizing the social differences between men and women. Through this book she opposed patriarchy and Caste System in India. Tarabai shinde was a social worker who was also a member of the satyasodhak samaj. This book was published in Marathi, is considered the first text of modern feminisms.

21. **Which of the following are NOT contents of soil?**
(a) Bacteria and fungi
(b) Steroids
(c) Grains of stones
(d) Minerals

**Ans. (b) :** The main components of soil are minerals Organic matter, water and air. The actual amount of each of these depends on the type of Soil. where as the main factors responsible for soil formation are relief, parent material, climate, vegetation and other life forms and time. Therefore, steroids are not included in the soil components.

22. **Who said, "Literacy in itself is not Education"?**
(a) Jawaharlal Nehru
(b) Mahatma Gandhi
(c) Bal Gangadhar Tilak
(d) BR Ambedkar

**Ans. (b) :** Literacy in itself is not education" This statement is of Mahatam Gandhi Gandhiji believed that education should develop all aspects of the individual harmoniously. Mahatam Gandhi came up with a special education program in 1937 which was known as wardha education plan.

23. **In which of the following Olympic Games did Dipa Karmakar participate?**
(a) Rio 2016
(b) London 2012
(c) Athens 2004
(d) Beijing 2008

**Ans. (a) :** Dipa Karmakar is an Indian gymnast who hails from Tripura. In Rio - 2016, Dipa Karmakar became the first gymnast to represent the country in the Olympic games. She also became the first gymnast to win a bronze medal at the 2014 common wealth Games in Glasgow.

24. **What is the value of 1 electron volt (eV), which is especially used for nuclear science?**
(a) $1.602 \times 10^{-19}$ Joules
(b) $1.902 \times 10^{-10}$ Joules
(c) $1.202 \times 10^{-15}$ Joules
(d) $2.202 \times 10^{-11}$ Joules

**Ans. (a) :** The value of 1 electron volt (eV) is $1.602 \times 10^{-19}$ Joules. 1 eV is defined as the energy gained by an electron when it is accelerating through a potential difference of 1 volt. Joule is the SI unit of energy.

25. **Certain grass-eating animals complete the digestion of food in two processes. First, they swallow partially digested food and then they regurgitate and chew upon that food again. What are such animals known as?**

(a) Heterotrophs
(b) Regurgitates
(c) Autotrophs
(d) Ruminants

**Ans. (d) :** Ruminant animals are herbivorous mammals. These animals complete the digestion of food in two processes. First they swallow partially digested food, and then regurgitate (chew) that food. These animals are called Ruminants, eg - cattle, giraffe, camel, deer etc. They chew and regurgitate plant based food several times a day and this food is then digested in the stomach chambers.

**26. Who introduced the Digital Personal Data Protection Bill in the Lok Sabha on 3 August 2023 ?**
(a) Subrahmanyam Jaishankar
(b) Piyush Goyal
(c) Anurag Singh Thakur
(d) Ashwini Vaishnaw

**Ans. (d) :** On August 3, 2023 Union Minister Ashwini Vaishnaw introduced the digital personal Data protection Bill in the lok Sabha, An important step towards establishing a legal frame work for the country growing digital ecosystem. These law will help citizens resolve cyber disputes in a timely manner, provide remedies and enforce the rule of law on the internet.

**27. What is the unit of electric current?**
(a) Ohm (b) Ampere
(c) Volt (d) Watt

**Ans. (b) :**

| Quantity | Unit |
|---|---|
| Electrical Resistance | Ohm |
| Electric current | Ampere |
| Electric Potential | Volt |
| Power | Watt |

**28. The Battle of Chandawar was fought between Muhammad Ghori and _____, a ruler of the Gahadavala dynasty, in 1194.**
(a) Vijayachandra
(b) Govindachandra
(c) Jaichand
(d) Harishchandra

**Ans. (c) :** The battle of Chandawar was fought in 1194 AD between the invader Mohammad Gauri and the ruler of Gahadavala dynasty Jaichand, in which Jaichand was defeated. After defeating Jaichand in the Battle of chandwar, Mohammad Ghori Captured most of the north India.

**29. According to Article 243 I of the Constitution, the Governor of a state constitutes the Finance Commission for every _____.**
(a) 2 years (b) 3 years
(c) 5 years (d) 7 years

**Ans. (c) :** According to Article 243 (I) of the constitution the Governor of the state shall constitute a Finance Commission to review the Financial position of the Panchayat for every 5 years. the financial commission will distribute the taxes. The finance commission will suggest necessary measures to improve the Financial condition of the panchayats etc.

**30. When did the government launch Start-up India Seed Fund Scheme?**
(a) 2020 (b) 2021
(c) 2022 (d) 2023

**Ans. (b) :** Startup India seed fund scheme was launched by the department for promotion of Industry and Internal Trade (DPIIT) on April 19, 2021. It Provides financial assistance to startup for proofs concept, Prototype development, product trials. Market enter and commercial sation through eligible incubators.

**31. Which organelle is responsible for producing ATP, the cell's energy currency?**
(a) Nucleus
(b) Mitochondrion
(c) Golgi apparatus
(d) Endoplasmic reticulum

**Ans. (b) :** The energy currency of the cell is ATP which is produced in Mitochondria. It is also called the power house of the cell. Its main function is to deliver energy to every part of the cell. They produce the chemical energy needed to power the biochemical reactions of the cell the process of cellular respiration is completed in mitochondria which converts nutrients in to ATP.

**32. The Y-shaped proteinaceous structure produced by the immune cells to defend our body against harmful bacteria and viruses are known as:**
(a) Immunoglobulin
(b) Amino Acids
(c) Collagen
(d) Haemoglobin

**Ans. (a) :** The Y-shaped proteinaceous structure produced by the immune cells to defend our body against harmful bacteria and viruses are known as Immunoglobulin. Immunoglobulin's or antibodies are essential in protecting against bacteria. Viruses and fungi.

**33. Who is the governor of Reserve Bank of India as of May 2023?**
(a) Shaktikanta Das
(b) Urijit Patel
(c) Raguram Rajan
(d) YV Patel

**Ans. (a) :** Presently the governor of Reserve Bank of India is Dr. Shaktikanta Das. The Reserve Bank was established on April 1, 1935 Under the reserve Bank of India Act 1924 and was nationalized in 1994. At Present the Reserve Bank of India consists of one Governors and four deputy Governors.

**34. Which Article of the Constitution of India mentions about enlargement of the jurisdiction of the Supreme Court?**

(a) Article 138
(b) Article 140
(c) Article 142
(d) Article 144

**Ans. (a) :** Article 138 of the constitution of India mention the enlargement of the jurisdiction of the supreme court. According to this, the supreme court shall have such further jurisdiction and powers with respect to any subject with respect list and the supreme court shall have subject as may be granted to the Government of India and the Government of any state by special agreement.

**35. Which of the following is NOT an animal of Phylum Chordate?**

(a) Snake (b) Rabbit
(c) Earthworm (d) Frog

**Ans. (c) :** Phylum Chordate belongs to the kingdom Animalia and includes all vertebrate animals and many invertebrates. They Possess a is bilaterally symmetrical body segmented, Triploblastic. Eg- snake rabbit, frog etc, Whereas earth worm is an organism belonging to the phylum Annelida.

**36. Which of the following is a simple monocarboxylic acid containing two carbons?**

(a) Valeric acid
(b) Palmitic acid
(c) Acetic acid
(d) Capric acid

**Ans. (c) :** Monocarboxylic acid are molecules contains only one carboxylic acid group (–COOH) like acetic acid, formic acid, benzoic acid etc. They are weak acids, which can lose a proton or deprotonate, from carboxylateions.

**37. In which of the following countries was the revolutionary Ghadar Party formed?**

(a) Germany
(b) England
(c) The US
(d) Switzerland

**Ans. (c) :** The Ghadar Party was an international political movement, which included non-resident Indians. Its objective was to over throw the British rule in India. It was established on July 15, 1913 in Astoria, Oregon with the headquarters of Ghadar and Hindustan Ghader newspaper based in San Francisco, California, Us. It was founded by Lala Hardayal, Sohan singh Bhakna, Baba wala singh.

**38. Which of the following is the structural and functional unit of an organism?**

(a) Cell
(b) Mitochondria
(c) ATP
(d) Nucleus

**Ans. (a) :** The cell is the structural and functional unit of an organism. The cell is the smallest unit of life and all the living beings are made up of cells. A cells is capable of carrying out all life processes, such as nutrition, excretion, respiration etc. hence it is called as the functional unit of life.

**39. Which Article of the Constitution of India prohibits discrimination on the grounds of religion, race and caste?**

(a) Article 15 (b) Article 16
(c) Article 17 (d) Article 18

**Ans. (a) :** Article 15 of the Indian Constitution Prohibits discrimination on the grounds of religion race, sex and caste. Part - III of the Indian constitution deals with fundamental rights. In this 6 fundamental rights have been provided to every citizen and Article 12 - 35 are related to theses rights. Part- III is called Magna Carta of the constitution.

**40. Which directive principle was added by the 97$^{th}$ Amendment Act 2011?**

(a) Promotion of co-operative societies
(b) Uniform civil code for the citizens
(c) Separation of judiciary from executive
(d) Organisation of village panchayats

**Ans. (a) :** The 97th Constitutional Amendment Act, 2011 is related to the effective Management of Co operative societies . According to this, the right to form Co-operative societies was include in the fundamental rights under Article 19(1) (c), a new Article 43(B) was included in the directive Principles of state policy and a new part 9-B was included.

**41. Which term refers to the increasing concentration of toxins within each successive link in the food chain?**

(a) Biomagnification
(b) Facilitation
(c) Denitrification
(d) Stratification

**Ans. (a) :** Biomagnifications refers to the increasing concentration of toxins within each successive link in the food chain. In other words Biomagnifications can be defined as accumulation and transfer of substances via food webs, resulting in an increase of internal concentration in organisms at succeeding levels in the trophic chain.

**42. Eukaryotic organisms can have very complex functions to sustain themselves. At the cellular level, these involve several different types of chemical functions like energy production, metabolism etc. What are the membrane-**

**bound structures called, which are present within the cell to keep each of these functionalities separate?**

(a) Cytoplasm
(b) Plasma gel
(c) Organelles
(d) Nucleoid

**Ans. (c) :** Eukaryotic organisms can have very complex functions to sustain themselves at the cellular level, these involve several different types of chemical functions. like energy productions, metabolism etc. The membrane bound structures are called as organelles, which are present with in the cell to keep each of these functionalities separate such as mitochondria, golgi bodies ribosome's, lysosomes etc.

**43. The process of measuring various physical and chemical properties of the rocks and fluids within a wellbore is known as:**

(a) well logging
(b) drilling
(c) reservoir modelling
(d) enhanced oil recovery techniques

**Ans. (a) :** The process of measuring various physical and chemical properties of the rocks and fluids with in a wellbore is known as well logging. Well logging is used for electrical imaging, mine mapping and hydrocarbon and hydrological exploration to obtain in properties of possible reservoir rocks.

**44. Who among the following related to Patiala gharana?**

(a) Goswami Lalji Mahara
(b) Ghagge Nazir Khan
(c) Fateh Ali Khan and Ali Baksh Khan
(d) Amir Khan

**Ans. (c) :** The Patiala Gharana is one of the most prominent gharanas of vocal Hindustani classical of Famous musicians, many of whom came to be patronized by the royal family of Patiala, Together Ali Baksh khan and Fateh Ali khan made a wonderful combination and Presided at the Patiala Gharana.

**45. When was the 'Mahatma Gandhi Series' of Indian Bank notes started?**

(a) 1996 (b) 2000
(c) 1994 (d) 1991

**Ans. (a) :** Mahatma Gandhi series of Indian Bank notes was launched in 1996 and has so far issued notes in the Denomination of Rs 5, Rs, 10, Rs 20, Rs 50, Rs 100, Rs 500, and Rs 1000 in this series. It is note worthy that the Reserve Bank of India issued first commemorative note of Rs 100 in 1969.

**46. The central government, in 2021, set up an eight-member panel for framing a new law for drugs, cosmetics and medical devices. Who headed that panel?**

(a) Dr. VG Somani (b) A K Pradhan
(c) N L Meena (d) Rajiv Wadhawan

**Ans. (a) :** The central Government Constituted an eight member panel to frame a new law for drugs cosmetics and medical devices in 2021, Headed by or V.G. Somani as its chairperson.

**47. The _____ Health Card Scheme was launched by the Government of India in the year 2014-15.**

(a) Forest (b) Water
(c) Mineral (d) Soil

**Ans. (d) :** Soil Health card scheme was launched by the Government of India in the year 2014 - 15. Soil health Card is used to assess the Current status of soil Health and when used over time, determine changes in soil health affected by land management.

**48. Which of the following does NOT affect the changes in the states of matter?**

**A) Changing the kinetic energy in the particles of the matter**
**B) Changing the temperature of the matter**
**C) Changing the pressure on the matter**
**D) Changing the colour of the matter**

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

**Ans. (b) :** The factors that affect the Changes in the states of matter are temperature and pressure which can change the physical state of matter when thermal energy is added to a substance its temperature increases, the kinetic energy of the molecules of the substance increases and its state changes. The Color of the substance does not affect the change in state.

**49. What is the difference between a somatic cell and a reproductive cell?**

(a) Somatic cells undergo mitotic cell division while reproductive cells undergo meiotic cell division
(b) The somatic cells have mitochondria but the reproductive cells do not have any mitochondria
(c) Somatic cells do not contain any chromosome while reproductive cells have their own chromosome
(d) The somatic cell and reproductive cell are neither diploid nor haploid

**Ans. (a) :** The cell which divides in cell division is called the generative cell. Mitoses also called as somatic cell division because this division occurs in cells in vegetative meiotic cells division occurs in reproductive cells. Gametes are formed in this division In mitotic division two identical cells are formed.

**50. Which agency supported the Bihar State Rural Livelihoods Mission (Jeevika) in developing digital financial services?**

(a) SBI
(b) RBI
(c) SIDBI
(d) SEBI

**Ans. (c) :** Small Industries Development Bank of India supported Bihar state Rural livelihood mission in the development of digital financial services. SIDBI was established in April 1990. Its headquarter is located in Lucknow.

## Section : General Engineering Electrical

**1. In regard to installations of street lighting, what is the average illumination level of Class A1 installations used in important shopping centres and at road junctions?**

(a) 20 lumens/$m^2$ (b) 10 lumens/$m^2$
(c) 30 lumens/$m^2$ (d) 40 lumens/$m^2$

**Ans. (c) :** In regard to installations of street lighting, the average illumination level of class A1 installations used in important shopping centres and at road junctions is 30 lumens/$m^2$.

- In poorly lighted suburban streets an illumination level of 4 lumen/$m^2$ is sufficient. While an average well-lighted street will require an illumination level between 8 to 15 lumens/$m^2$.

| Place and work | Illumination level (in lux) |
|---|---|
| Class room | 230-300 |
| Drawing hall | 500-1000 |
| In hospital (General) | 150 |
| Operation theater | 500-1000 |
| Exhibition hall | 1000 |
| Kitchen | 200-300 |
| Dining and refreshment room | 100-150 |
| Very precise mechanical or other work | 1000-2000 |
| In meeting hall, library | 250-500 |

**2. In internal wiring estimation, if the connected load is 2 kW and the supply voltage is 240 V, then the maximum load current will be _____.**

(a) 8.33 A (b) 80 A
(c) 4.33 A (d) 1.14 A

**Ans. (a) :** Given that,
Connected load (P) = 2 kW
Supply voltage (V) = 240V

Maximum load current (I) = $\frac{P}{V}=\frac{2000}{240}=8.33A$

**3. If the distance between the plates of a parallel plate capacitor is increased 10 times and the area is reduced to one-fourth, then its capacitance _____.**

(a) becomes $\frac{1}{40}$ times
(b) becomes one half
(c) increases 2.5 times
(d) becomes 40 times

**Ans. (a) : Parallel plates capacitance-**

$C_1=\frac{\varepsilon_0\varepsilon_r A_1}{d_1}$ …….. (i)

If, $d_2 = 10d_1$

$A_2=\frac{A_1}{4}$

Then, capacitance $(C_2)=\frac{\varepsilon_0\varepsilon_r A_2}{d_2}$

$C_2=\frac{\varepsilon_0\varepsilon_r A_1/4}{10d_1}$

$C_2=\frac{1}{40}\left(\frac{\varepsilon_0\varepsilon_r A_1}{d_1}\right)$

$C_2=\frac{1}{40}C_1$

**4. If the value of the common base current gain ( $\alpha$ ) is 0.98, then the value of the common collector current gain ( $\gamma$ ) is _____.**

(a) 98 (b) 49
(c) 0.02 (d) 50

**Ans. (d) :** Given that,
Common base current gain ($\alpha$) = 0.98
Common collector current gain ($\gamma$) = ?

Common emitter current gain $(\beta)=\frac{\alpha}{1-\alpha}$

$\beta=\frac{0.98}{1-(0.98)}=\frac{0.98}{0.02}$

$\beta = 49$

Common collector current gain ($\gamma$) = 1+$\beta$
= 1+49
= 50

**5. Which of the following factors will NOT affect the selection of a resistor?**

(a) Frequency range
(b) Tolerance
(c) Thermal resistivity
(d) Power rating (in watts)

**Ans. (a) :** Frequency range will not affect the selection of a resistor.
**Following factor will affect the selection of a resistance-**

- Tolerance
- Thermal resistivity
- Power rating (in Watt)
- Voltage rating
- Long-term stability
- High temperature performance.

**6. The back EMF in a DC motor opposes the supply voltage. This is explained by _____.**

(a) Lenz's law
(b) Faraday's laws of electromagnetic induction
(c) Fleming's left hand rule
(d) Fleming's right hand rule

**Ans. (a) :** The back EMF in a DC motor opposes the supply voltage, this is explained by Lenz's law. "According to Lenz's law when a voltage is generated by a change in magnetic flux then according to Faraday's law, the polarity of the induced voltage is such that it produces a current whose magnetic field opposes the change which produces it"

**7. The AC ripples can be reduced in a rectifier circuit by using capacitive filter by _____ the capacitance value and by _____ the input frequency.**
(a) increasing; increasing
(b) increasing; decreasing
(c) decreasing; increasing
(d) decreasing; decreasing

**Ans. (a) :** The AC ripples can be reduced in a rectifier circuit by using capacitive filter by increasing the capacitance value and by increasing the input frequency.
Ripple factor of a full wave rectifier using capacitor filter is given by-

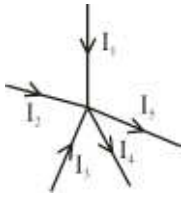
$$\text{Ripple factor}(\gamma)=\frac{1}{4\sqrt{3}R_L Cf}$$

Where, C = capacitance
F = input frequency

Hence, $\downarrow \gamma \propto \frac{1}{C\uparrow}, \downarrow \gamma \propto \frac{1}{f\uparrow}$

**8. Which of the following facts is correct for KCL?**
(a) Zero charge accumulation at node
(b) Possibility of charge accumulation at node
(c) Charge accumulation may or may not be possible
(d) Energy may be stored at the node

**Ans. (a) :** Zero charge accumulation at node is the correct statement for KCL.
According to KCL (Kirchhoff's current law), the total current entering a junction or a node is equal to the current leaving the node thus no charge is lost.



$I_1 + I_2 + I_3 = I_4 + I_5$

**9. A 4 pole, 50 Hz IM operates at 7% slip. The frequency of EMF induced in the rotor will be __.**
(a) 2.5 Hz (b) 0.5 Hz
(c) 3.5 Hz (d) 1.5 Hz

**Ans. (c) :** Given that,
Pole (P) = 4
Supply frequency (f) = 50 Hz
% slip (s) = 7%
Rotor frequency ($f_r$) = ?

$f_r = sf$

$f_r = \frac{7}{100}\times 50$

$f_r = 3.5\text{Hz}$

**10. Which of the following is an example of an electrostatic type instrument?**
(a) Kelvin multicellular voltmeter
(b) Hot wire instrument
(c) Wattmeter
(d) Energy meter

**Ans. (a) :** Kelvin multicellular voltmeter is an example of an electrostatic type instrument.
**Kelvin's multicellular voltmeter-** It is essentially a quadrant type instrument, but with the difference that instead of four quadrants and one vane, it has a large number of fixed quadrants and vanes mounted on the same spindle. In this way, the deflecting torque for a given voltage is increased many times. Such voltmeters can be used to measure voltage as low as 30V.

**11. Transmission efficiency of a transmission line increases with the _____.**
(a) increase in power factor but the decrease in voltage
(b) increase in voltage only power factor remains constant
(c) increase in power factor and voltage
(d) decrease in power factor and voltage

**Ans. (c) :** $P = VI\cos\phi$
At constant power of transmission line

$I \propto \frac{1}{V}$ and $I \propto \frac{1}{\cos\phi}$

At higher voltage and high power factor current will be lesser, therefore we can minimize the transmission losses and increases the efficiency of transmission line.

**12. The line voltage of a delta connected three phase circuit is 415 V. The phase voltage is:**
(a) 230 V (b) 240 V
(c) 220 V (d) 415 V

**Ans. (d) :** For delta connection-

$V_L = V_{ph}$

$I_L = \sqrt{3}I_{ph}$

Where, $V_L$ = line voltage
$V_{ph}$ = phase voltage
$I_L$ = Line current
$I_{ph}$ = Phase current
Given that ,

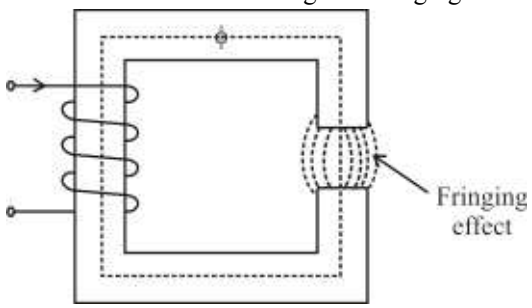
$V_L = 415\text{V}$

Then, $V_{ph} = 415\text{V}$

**13. In a magnetic circuit, when magnetic flux is passing across the air gap, then effective area of the gap increases and magnetic flux density decreases in the gap. This effect is known as _____.**

(a) magnetising force
(b) magnetic fringing
(c) magnetic leakage
(d) magnetic hysteresis

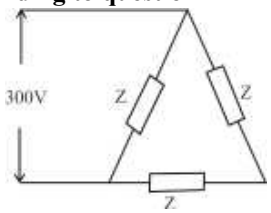
**Ans. (b) :** In a magnetic circuit, when magnetic flux is passing across the air gap, then effective area of the gap increases and magnetic flux density decreases in the air gap. This effect is known as magnetic fringing.




**14. Three identical impedances are connected in delta. The load is supplied by a 3-phase supply of 300V. the line current is $30\sqrt{3}$A . Calculate the impedance per phase.**

(a) 30Ω (b) $10\sqrt{3}$ Ω
(c) 20 Ω (d) 10 Ω

**Ans. (d) : According to question-**




For delta connection,

$V_L = V_{Ph}$

$V_{Ph} = 300V$

$I_L = 30\sqrt{3}A$

$$I_{Ph} = \frac{I_L}{\sqrt{3}} = \frac{30\sqrt{3}}{\sqrt{3}} = 30A$$

$$\text{Impedance per phase } (Z_{ph}) = \frac{V_{ph}}{I_{ph}} = \frac{300}{30} = 10\Omega$$

**15. Determine the force required to separate two magnetic surfaces with a contact area of $4\pi$ cm$^2$ and the magnetic flux density across the surface is 1 wb/m$^2$.**

(a) 800 N (b) 500 N
(c) 100 N (d) 1000 N

**Ans. (b) :** Given than,

Contact area (A) = $4\pi$ cm$^2$ = $4\pi \times 10^{-4}$ m$^2$

Flux density (B) = 1Wb/ m$^2$

Force (F) = ?

$$F = \frac{B^2A}{2\mu_0}$$

$$= \frac{(1)^2 \times 4\pi \times 10^{-4}}{2 \times 4\pi \times 10^{-7}}$$

$$= \frac{1000}{2}$$

F = 500N

**16. The efficiency of a 60 Hz, 6-pole, 1000 rpm 3-phase induction motor is _____.**

(a) 69.3% (b) 83.4%
(c) 94.2% (d) 75.5%

**Ans. (b) :** Given that,

Frequency = 60 Hz, pole (P) = 6

$N_r = 1000$ rpm

$$N_s = \frac{120f}{P} = \frac{120 \times 60}{6} = 1200 \text{ rpm}$$

$$\% \text{ Efficiency} = \frac{N_r}{N_s} \times 100$$

$$= \frac{1000}{1200} \times 100$$

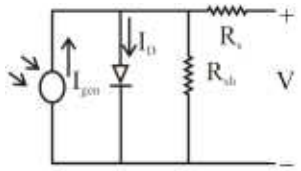
= 83.4%

**17. The equivalent electrical circuit of a solar PV cell has a _____.**

(a) diode (b) capacitor
(c) transistor (d) inductor

**Ans. (a) :** The equivalent electrical circuit of a solar PV cell has a diode

**Equivalent circuit of solar cell:**




The equivalent circuit of a solar cell consists of an ideal current generator in parallel with a diode in reverse bias, both are connected to a load. The generated current is directly proportional to light intensity.

**18. What will be the stored energy by a 100 mH inductor when 1 A current is flowing through it?**

(a) 0.01 J (b) 0.005 J
(c) 0.001 J (d) 0.05 J

**Ans. (d) :** Given that,

L=100 mH, I = 1A

$$\text{Stored energy in inductor} = \frac{1}{2}LI^2$$

$$= \frac{1}{2} \times 100 \times 10^{-3} \times 1$$

= 0.05J

**19. Which of the following statements are true for synchronous motor losses?**

**(A) Friction and windage losses increase with the cube of speed.**

**(B) The Eddy current loss is reduced by laminating the core.**

**(C) Copper losses are independent of load.**

**(D) Core losses increase with the square of the load.**

(a) A and B (b) C and D

(c) A and D (d) B and C

**Ans. (a) :** In a synchronous motor, friction and windage losses do not depend upon the load condition of the machine, they are the function of the speed only, hence friction and windage losses increase with the cube of speed.

The eddy current loss is reduced by laminating the core.

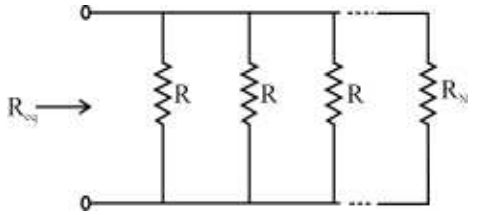
Therefore statement A and B are true.

**20. Ten resistors having the same value of resistance i.e. 10 ohm, are connected in parallel. What will be the equivalent resistance of this connection?**

(a) 1. 5 ohm (b) 2 ohm

(c) 1 ohm (d) 100 ohm

**Ans. (c) :**




$$R_{eq} = \frac{R}{N}$$

Resistance of each resistor =10Ω

Number of resistor (N) =10

$$R_{eq} = \frac{R}{N} = \frac{10}{10} = 1\Omega$$

**21. At higher forward voltages, a junction diode is likely to _____.**

(a) become noisy (b) get saturated

(c) break down (d) burn out

**Ans. (d) :** At higher forward voltage, a junction diode is likely to burn out. This occurs when the forward voltage exceeds the maximum allowable voltage rating of the diode. The excessive voltage causes an excessive current to flow through the diode, leading the overheating and damaging the diode.

**22. Which of the following factors will NOT affect the selection of an inductor?**

(a) Power loss

(b) Dielectric constant

(c) Current rating

(d) Quality factor

**Ans. (b) :** Dielectric constant will not affect the selection of an inductor.

Following factors affect the selection of an inductor-

(i) Power loss

(ii) Current rating

(iii) Quality factor

Quality factor (Q) = $\frac{2\pi fL}{R}$

**23. In CE configuration, the collector supply voltage $V_{CC}$ = 10V, and $R_C$ = 8kΩ. Determine the quiescent point Q for zero signal if the base current is $I_B$ = 15μA and β = 40.**

(a) $I_C$ = 1 mA and $V_{CE}$ = 7V

(b) $I_C$ = 0.6 mA and $V_{CE}$ = 5.2V

(c) $I_C$ = 0.6 mA and $V_{CE}$ = 6V

(d) $I_C$ = 1 mA and $V_{CE}$ = 5.2V

**Ans. (b) :** Given that,

$V_{CC} = 10V$, $R_C = 8k\Omega$

$I_B = 15\mu A$, $\beta = 40$

For, common emitter configuration-

$$V_{cc} = V_{CE} + I_C R_C, \quad \beta = \frac{I_c}{I_B}$$

$$\beta = \frac{I_C}{I_B}$$

$$40 = \frac{I_c}{15\times10^{-6}}$$

$I_C = 0.6$ mA

$V_{CE} = V_{CC} - I_C R_C$

$= 10 - 0.6\times10^{-3}\times8\times10^{3}$

$V_{CE} = 10 - 4.8$

$V_{CE} = 5.2$ V

**24. A combination of integral-cycle control and switching-instant control on the applied voltage wave is employed in IM for _____**

(a) smooth speed control

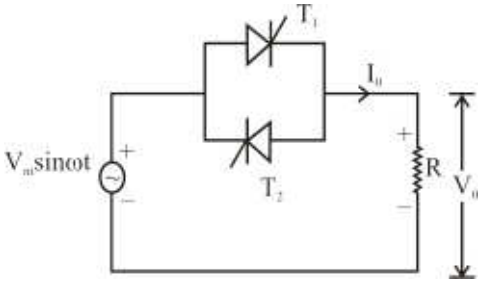
(b) rotor resistance control only

(c) frequency control

(d) stator resistance control

**Ans. (a) :** A combination of integral cycle control and switching-instant control on the applied voltage wave is employed in IM for smooth speed control

**Integral cycle controller-**

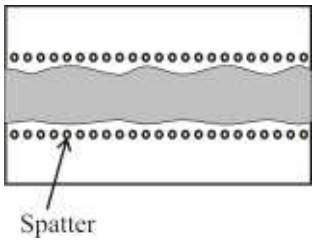


- Due to less harmonics the integral cycle control method is used in heating loads and motor control drives.
- It is a converters with the ability to perform direct switching without losses.

**25. The scattering of molten metal droplets outside the weld zone, which can lead to surface irregularities is called weld_____.**

(a) spatter (b) slag inclusions
(c) burn-through (d) under fill

**Ans. (a) :** The scattering of molten metal droplets outside the weld zone, which can lead to surface irregularities is called weld spatter.




- Weld spatter is caused by a variety of factors, including the type of welding process being used, the speed of welding, and type of metal being welding.
- One of the primary causes of weld spatter is the presence of impurities in the metal being welded.

**26. Medium transmission lines CANNOT be analysed by using which of the following methods?**

(a) Nominal T method
(b) Load end capacitance
(c) Cognitive method
(d) Nominal Pi method

**Ans. (c) :** Medium transmission lines can not be analysed by using cognitive method.
The most commonly used methods for the solution of medium transmission line are-
1. Normal T method
2. Normal π method
3. End condenser method

- Medium transmission lines have sufficient length 80-200 km and usually operate at voltages greater than 20 kV.
- The effect of capacitance cannot be neglected.

**27. What does the area under the Load Duration Curve represent?**

(a) The total electricity consumption of consumers during the day
(b) The total number of units generated for the period considered
(c) The load factor of the power station
(d) The total power generated by a power plant during the day

**Ans. (b) :** The area under the load duration curve represent the total number of units generated for the period considered.
Load duration curve are arranged in the order of descending magnitudes.

$$\text{Unit generated/annum} = \text{Maximum demand (in kW)} \times \text{load factor} \times 8760.$$

- Load factor = $\frac{\text{Average laod}}{\text{Maximum demand}}$

**28. Which statement is NOT true for fixed drum type biogas power plant?**

(a) It has no corrosion problem.
(b) It has a lower cost.
(c) The gas production per cubic metre of digester is less.
(d) It has constant pressure of biogas.

**Ans. (d) : Fixed drum type biogas power plant-**
- It is recommended only where construction can be supervised by experienced biogas technicians.
- The gas pressure fluctuates substantially depending on the volume of the stored gas.
- It has no corrosion problem.
- It has a lower cost.
- The gas production per cubic metre of digester is less

Hence option (d) is not correct.

**29. Chargeable expenses are occasionally also termed as _____.**

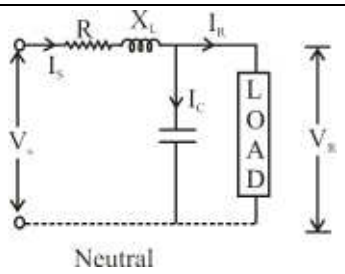
(a) direct expense
(b) major expense
(c) lump sum expense
(d) overhead expense

**Ans. (a) :** Chargeable expenses are occasionally also termed as direct expense. Chargeable expenses are any costs that your agency or client has agreed to reimburse to you. These will usually be invoiced through the umbrella company and well require an expense form, signed by the client, to support the claim.

**30. Which of the following is true for the performance analysis of medium transmission line using end condenser method?**

(a) The voltage across the load is higher than the voltage across the lumped line capacitance.
(b) The voltage across the load is lower than the voltage across the each different distributed line capacitance.
(c) The voltage across the load is equal to the voltage across the lumped line capacitance.
(d) The voltage across the load is higher than the voltage across the each different distributed line capacitance.

**Ans. (c) : End condenser method:**
In this method, the capacitance of the line is lumped or concentrated at the receiving end. The voltage across the load is equal to the voltage across the lumped line capacitance.




$$\vec{V}_s = \vec{V}_R + \vec{I}_s\left(R + jX_L\right)$$

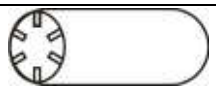
Where, $V_S \rightarrow$ Sending end voltage

$V_R \rightarrow$ Receiving end voltage

**31. In regard to the construction of a synchronous alternator, hydro alternators have _____.**

(a) larger diameter and low speed
(b) larger diameter and high speed
(c) low speed and smaller diameter
(d) high speed and smaller diameter

**Ans. (a) :** In regard to the construction of a synchronous alternator, hydro alternators have large diameter and low speed.

| **Salient pole type alternator** | **Cylindrical pole type alternator** |
|---|---|
|  |  |
| Practically 12-20 poles are used. | Practically 2-4 poles used. |
| It has large diameter and small axial length. | It has large axial length and small diameter. |
| It has non uniform air gap | It has uniform air gap |
| It has low synchronizing capacity. | It has high synchronizing capacity. |
| Hunting occurs. | Negligible hunting. |
| Preferred for low speed alternators. **Ex-** Used in hydro power plant. | Preferred for high speed alternators. **Ex-** Used in thermal power plant |

**32. How does the power factor affect the reading of a wattmeter if voltage and current are unaltered?**

(a) The reading is independent of the power factor.
(b) The reading increases with square of the power factor.
(c) The reading increases with the power factor.
(d) The reading decreases with the power factor.

**Ans. (c) :** The power factor of a load affect the reading on a wattmeter. If voltage and current are unaltered then the reading increases with the power factor.

Reading of 1- $\phi$ Wattmeter (W) = VI cos$\phi$

If VI is constant

Then, $P \propto \cos\phi$

A wattmeter measures the real power consumed by a load, which is the power actually used to perform work. The power factor of the load indicates how effectively the load converts electrical power into useful work.

**33. Two coupled inductors $L_1$ = 8H and $L_2$ = 32H have coefficient of coupling K = 0.4. The mutual inductance between them is**

(a) 40 H (b) 102.4 H
(c) 64 H (d) 6.4 H

**Ans. (d) :** Given that,

$L_1 = 8$ H

$L_2 = 32$ H

$K = 0.4$

$$\because K = \frac{M}{\sqrt{L_1 L_2}}$$

Mutual inductance (M) = $K\sqrt{L_1 L_2}$

$= 0.4\sqrt{8 \times 32}$

$= 6.4$ H

**34. The range of signal generating frequencies for a function generator is _____.**

(a) 0.01 kHz to 100 Hz
(b) 0.01 Hz to 100 Hz
(c) 0.01 kHz to 100 kHz
(d) 0.01 Hz to 100 kHz

**Ans. (d) :** The range of signal generating frequencies for a function generator is 0.01 Hz to 100 kHz.

Function generator is an instrument that can generate common waveforms like triangle, sine, cosine, square, sawtooth etc. it also provides options for changing the characteristics of the waveforms such as amplitude and frequency.

**35. In thermal power plant, the fire tube and water tube boilers are classified based on**

(a) tubular heating surface
(b) the combustion product formation
(c) state of fuel
(d) steam formation rate

**Ans. (a) :** In thermal power plant, the fire tube and water tube boilers are classified based on tubular heating surface.

| **Fire tube boilers** | **Water tube boiler** |
|---|---|
| In fire tube boilers hot flue gasses pass through tubes and water surrounds them. | In water tube boilers water passes through tubes and hot flux gasses surround them. |
| These are operated at low pressures upto 20 bar. | The working pressure is high, upto 250 bar in super critical boilers. |
| Load fluctuations can not be handled. | Load fluctuations can be easily handled. |
| This are bulky and difficult to transport. | These are light in weight. |
| Overall efficiency is upto 75%. | Over all efficiency with an economizer is up to 90%. |

**36. The total inductance of two coupled coils in the series opposing and series aiding connections are 12 mH and 38 mH, respectively. Find the mutual inductance between the coils.**

(a) 6.5 mH (b) 13 mH
(c) 26 mH (d) 10 mH

**Ans. (a) :** Given,
**Series opposing-**
$L_1+L_2 - 2M = 12$ mH ……(i)
**Series aiding-**
$L_1 + L_2 + 2M = 38$ mH ……(ii)
From equation (i) and (ii)-
$L_1 + L_2 = 25$ mH
$\therefore$ Put the value in equation (i)
$L_1 + L_2 - 2M = 12$ mH
$25 - 2M = 12$
$M = 6.5$ mH

**37. Which of the following statements are INCORRECT about auxiliary motor starting in synchronous motors?**

**(A) The function of the auxiliary motor is to run the synchronous motor at a speed less than its synchronous speed.**
**(B) The rating of the auxiliary motor is much lower than that of the synchronous motor.**
**(C) This method is used only for loaded synchronous motors.**
**(D) Auxiliary motor starting is not a commonly used starting method in modern days.**

(a) A and C (b) B and D
(c) A and D (d) A, C and D

**Ans. (d) :** The auxiliary motor brings the synchronous motor speed almost equal to its synchronous speed.
- The auxiliary motor starting cannot be used for loaded synchronous motors.
- Auxiliary motor starting is commonly used as starting method in modern days.
- The rating of the auxiliary motor is much lower than that of the synchronous motor.
- A 3-phase induction motor with two poles, fewer than the synchronous motor poles is used as an auxiliary motor.

Hence, statements A, C and D are incorrect.

**38. Which of the following statements regarding biochemical-based power plants is/are true?**

**(A) Methane is emitted along with carbon dioxide in aerobic digestion.**
**(B) Sewage gas represents a mix of carbon dioxide, methane and trace gas.**
**(C) Syngas is generated as a result of gasification in such a plant.**

(a) Only A and C
(b) Only B
(c) Only A and B
(d) Only B and C

**Ans. (d) : Biochemical-based power plants-**
- Sewage gas represents a mix of carbon dioxide, methane and trace gas.
- Syngas is generated as a result of gasification in such a plant.
- It is a renewable source of energy.
- Biogas can be cleaned and upgraded to natural gas standards when it becomes bio-methane.

Hence, only statement B and C are true.

**39. In a parallel resonant circuit, the input impedance of the circuit is _____.**

(a) minimum (b) zero
(c) maximum (d) infinite

**Ans. (c) :** In a parallel resonant circuit, the input impedance of the circuit is maximum.

| **Item** | **Series RLC circuit** | **Parallel RLC circuit** |
|---|---|---|
| Input impedance at resonance | Minimum | Maximum |
| Current at resonant | Maximum | Minimum |
| Effective impedance | R | L/CR |
| It magnifies | Voltage | Current |
| Power factor at resonance | Unity | Unity |
| Resonant frequency | $\frac{1}{2\pi\sqrt{LC}}$ | $\frac{1}{2\pi\sqrt{LC}}$ |

**40. The method which can be used for the speed control of an induction motor from the stator side is _____.**

(a) adding rheostats in rotor circuit
(b) V/Z control
(c) V/R control
(d) V/F control

**Ans. (d) :** V/F control method can be used for the speed control of an induction motor from the stator side. This method offers a wide range of speed control without affecting the efficiency of the motor.
**Stator side speed control methods-**
1. Voltage control method.
2. Frequency control method
3. Pole changing method
4. Stator resistance method
5. Constant V/F control

**Rotor side speed control method-**
1. Rotor resistance control method
2. Slip power recovery method
3. Cascading connection

**41. Which of the following statements are correct about the maintenance factor?**

**(I) It is the ratio of illumination under normal working condition to the total lumen given out by the lamp.**

**(II) It is the ratio of illumination under normal working condition to the illumination when the things are perfectly clean.**

**(III) The accumulation of dust, dirt and smoke on the lamp decreases the maintenance factor.**

**(IV) It is the ratio of illumination when the things are perfectly clean to the illumination under normal working condition.**

(a) Only Statement II
(b) Statements III and IV
(c) Statements II and III
(d) Statements I and III

**Ans. (c) : Maintenance factor-**
- It is the ratio of illumination under normal working condition to the illumination when the things are perfectly clean.
- the accumulation of dust, dirt and smoke on the lamp decreases the maintenance factor.
- Maintenance factor should be 0.4 to 0.8.

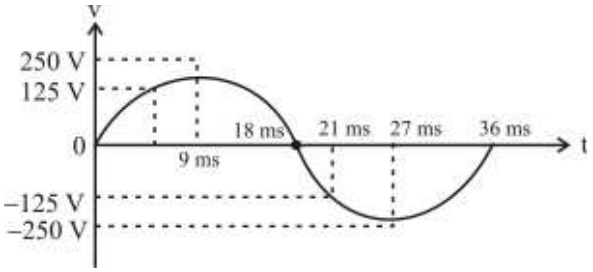
Hence, Statement II and III are correct.

**42. Which of the following testing methods is NOT used to test an AC energy meter?**
(a) Braking test
(b) Long period dial test
(c) Starting test
(d) Creep test

**Ans. (a) :** Braking test methods is not used to test an AC energy meter.
● **Creep Test-** Take a meter reading then turn off your power from the fuse. Wait 15-20 minutes and take another reading. The meter reading should not change as no energy is being used.

**43. A sinusoidal alternating voltage of time period 36 ms has the maximum value of 250 V. Its value will reach −125 V (half the value of negative maximum) after _____ milliseconds.**
(a) 9 (b) 21
(c) 3 (d) 18

**Ans. (b) :** Given, Time period (T) = 36ms,
$V_{max} = 250V$
For sinusoidal waveform the equation is
$v = V_m \sin\omega t$
For v = –125 Volt
$-125 = 250 \sin\omega t$
$-125 = 250 \sin\left(\frac{2\pi}{T}.t\right)$
$\because\ \omega = 2\pi f = \frac{2\pi}{T}$
$\frac{-125}{250} = \sin\left(\frac{2\pi}{T}.t\right)$
$-\frac{1}{2} = \sin\left(\frac{2\pi}{t}.t\right)$
Convert in degree and put $\pi = 180^o$
$\sin(210^o) = \sin\left(\frac{2\times180^o}{T}.t\right)$
$210^o = \frac{2\times180^o}{36ms}.t$
$210^o = \frac{360^o}{36ms}.t$
$\boxed{t = 21ms}$




**44. In heating effect, if 'I' is the current flowing through the conductor in 't' seconds having a resistance 'R', then the electrical energy supplied is _____.**
(a) $IR^2t$ joules (b) $I^2Rt$ joules
(c) $I^2R/t$ joules (d) $IR^2/t$ joules

**Ans. (b) :** According to Joules law, the amount of work required to maintain a current of I amperes through a resistance 'R' ohm for t second, then the electrical energy supplied is →
Electrical energy = $I^2Rt$ joules

**45. The receiving end voltage of a radial distribution network is 24 kV. What will be the sending end voltage, if the voltage drop is calculated 25% of receiving end voltage?**
(a) 18 kV (b) 32 kV
(c) 30 kV (d) 36 kV

**Ans. (c) :** Given that,
Receiving end voltage ($V_R$) = 24 kV
Voltage drop $(V_d) = 25\%$ of $V_R$
Voltage drop = $\frac{25}{100}\times24 = 6$ kV
Sending end voltage ($V_s$) = $V_R$ + Voltage drop
= 24 +6
= 30 kV

**46. In a brake test, the DC motor took 20 A from a 200 V supply mains. The brake pulley of radius 10 cm had an effective load of 20 kg and the speed was 10 rps. The value of BHP (in metric) is _____.**
(a) $1.3\pi$ (b) $8.8\pi$
(c) $0.2\pi$ (d) $0.5\pi$

**Ans. (d) :** Given that,
I = 20A, V = 200 V, radius (r) = 10 cm = 0.1 m
m = 20 kg, n = 10 r.p.s
Torque = Force × Effective radius

$= 20\times9.81\times0.1 \quad (\because F = m.g)$

$T = 19.62$ N–m

$\because P = T \times \omega$

$P = T \times 2\pi n$

$P = 19.62\times2\times\pi\times10$

$P = 392.4\ \pi$ watt

$P = \frac{392.4\pi}{735.5}$ H.P.

$P = 0.5\ \pi$

**47. In the context of electrical signals, if the signal generated has a definite pattern that repeats itself at regular intervals of time, such a signal is called _____.**

(a) dependent signal
(b) non-periodic signal
(c) independent signal
(d) periodic signal

**Ans. (d) :** In the context of electrical signals, if the signal generated has a definite pattern that repeats itself at regular intervals of time, such a signal is called periodic signal.

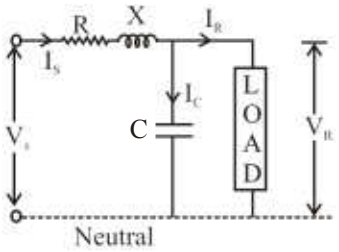
**Periodic signal-** A periodic signal is a signal that repeats itself at regular intervals. It is characterized by a fundamental frequency and a period.

**48. Which of the following represents the value of parameters A and D for a transmission line in end condenser method?**

(a) A = 1; D = 1 + ZY
(b) A = 1 + YZ, D = 1
(c) A = 1 + ZY; D = 1 + ZY
(d) A = 1 − ZY; D = 1 + ZY

**Ans. (b) : End condenser method:**

It is used for medium transmission line.




Where,

$V_S \rightarrow$ Sending end voltage

$V_R \rightarrow$ Receiving end voltage

$Z \rightarrow$ Impedance

$Y \rightarrow$ Admittance

$I_S \rightarrow$ Sending current

$I_R \rightarrow$ Receiving end current

$I_C \rightarrow$ Current through the capacitor

Apply KVL in the outer loop of the circuit-

$$Z = \sqrt{R^2 + X^2}$$

$V_S = V_R + I_S Z$ …….(i)

At the capacitor node, apply KCL,

$I_S = I_R + I_C$

$I_S = YV_R + I_R$ ……..(ii)

Put the value of $I_s$ in equation (i)

$V_S = V_R + (YV_R + I_R)Z$

$V_S = V_R + YZV_R + I_R Z$

$V_S = (1 + YZ)V_R + I_R Z$ ……(iii)

ABCD parameter-

$V_S = AV_R + BI_R$ ……(iv)

$I_S = CV_R + DI_R$ ……(v)

Compare equation (ii) and (iii) with (iv) and (v) respectively.

A=1+YZ

B = Z

C = Y

D = 1

**49. In magnetism, the measure of the ease with which magnetic flux can pass through a material is called _____.**

(a) flux density
(b) MMF
(c) permeance
(d) reluctance

**Ans. (c) :** In magnetism, the measure of the ease with which magnetic flux can pass through a material is called permeance. Permeance is the reciprocal of reluctance is a measure of magnetic circuit.

$\text{Permeance} = \frac{\text{flux}}{\text{mmf}}$

The SI unit of magnetic permeance is Weber/ampere-turn.

**50. Which of the following triggers the failure of successive parts?**

(a) Load shedding
(b) Incipient fault in power transformer
(c) Non-cascade tripping
(d) Brown out

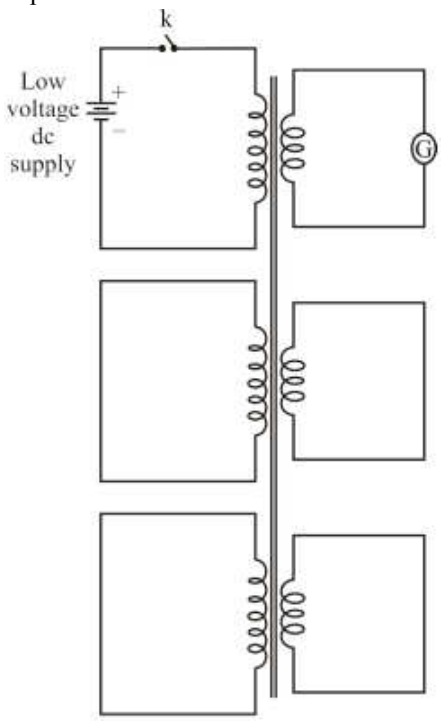
**Ans. (d) :** Brown out triggers the failure of successive parts. Brownouts have a wide variety of causes, like blackouts they can be caused by bad weather, another common cause of brownouts is an overloaded power grid.

**51. Which of the following is correct with reference to phasing out test on transformers?**

(a) This test is carried out only on 1-ϕ transformer to identify primary and secondary winding.
(b) This test is carried out both on 1-ϕ and 3- ϕ transformers to identify high-voltage winding.
(c) This test is carried out only on the 3-ϕ transformer to identify primary and secondary winding in the same phase.
(d) This test is carried out both on 1-ϕ and 3-ϕ transformers to identify the primary and secondary winding.

**Ans. (c) : Phase out test of the transformer:**

- This test is carried out only on the 3-ϕ transformer to identify primary and secondary winding in the same phase.




- All the phases of 3-ϕ transformer are short circuit except a primary.
- A low voltage D.C. supply is given through a battery to the primary winding.
- The key 'k' is connected as shown. Now the key is pressed and deflection of galvanometer is observed carefully.
- Similarly galvanometer is connected to the other secondaries and procedure is repeated.

**52. How does the load factor impact the cost of a unit (kWh) of electricity?**

(a) Higher load factor leads to lower generation costs per unit.
(b) Load factor only affects the demand charges, not the generation costs.
(c) Higher load factor leads to higher generation costs per unit.
(d) Load factor has no impact on the generation costs per unit.

**Ans. (a) : Load factor:** The ratio of average load to the maximum demand during a given period is known as load factor.

$$\text{Load factor} = \frac{\text{Average laod}}{\text{Maximum demand}}$$

- It is always less than 1.
- It plays key role in determining the overall cost per unit generated.
- High load factor leads to lower generation costs per unit.

**53. Which of the following statement is true regarding End Condenser method used for the performance analysis of medium transmission line?**

(a) Line capacitance is lumped at the sending end during the analysis.
(b) Line capacitance is considered distributed parameter during the analysis.
(c) Line capacitance is lumped between resistance and Inductance during analysis.
(d) Line capacitance is lumped at the receiving end during the analysis.

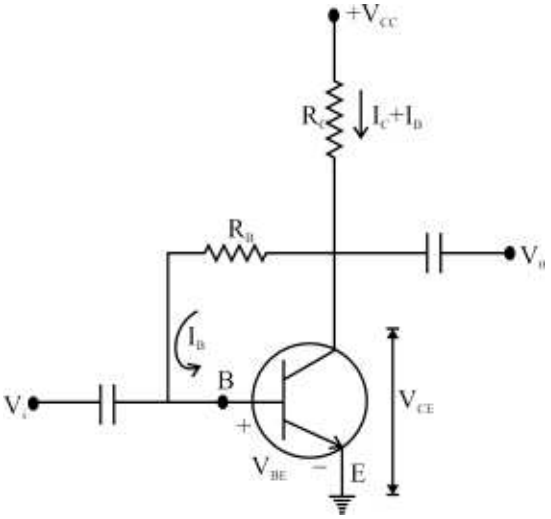
**Ans. (d) : End condenser method:**

- It is used for the performance analysis of medium transmission line.
- Line capacitance is lumped at the receiving end during the analysis.
- ABCD parameter → A = 1 + YZ
  B = Z
  C = Y
  D = 1

**54. The collector to the base bias configuration of a common emitter transistor implicitly employs:**

(a) voltage shunt negative feedback
(b) voltage series positive feedback
(c) current series negative feedback
(d) current shunt negative feedback

**Ans. (a) :** The collector to the base bias configuration of a common emitter transistor implicitly employs voltage shunt negative feedback.




**55. What is the meaning of the term 'load factor' ?**

(a) The ratio of average load to peak load over a year
(b) The ratio of total energy consumption to total energy production
(c) The ratio of total energy production to total energy consumption
(d) The ratio of peak load to average load over a year

**Ans. (a) : Load factor:** It is the ratio of average load to the maximum demand during a given period.

$$\text{Load factor} = \frac{\text{Average load}}{\text{Maximum demand}}$$

$$= \frac{\text{Unit generated in T hours}}{\text{Maximum demand} \times \text{T hours}}$$

**56. How many types of dependent sources are there?**

(a) 6 (b) 5
(c) 4 (d) 2

**Ans. (c) :** There are four types of dependent sources-
1. Voltage Controlled Voltage Source (VCVS)
2. Voltage Controlled Current Source (VCCS)
3. Current Controlled Voltage Source (CCVS)
4. Current Controlled Current Source (CCCS)

**57. Which of the following statements is/are NOT true for the damper winding in alternator?**

**(I) These are useful in preventing the hunting in alternators.**
**(II) Usually, damper windings are provided in smooth cylindrical type rotor alternators.**
**(III) Under normal working conditions, i.e., if machine is at synchronous speed, damper winding do not carry any currents.**
**(IV) Damper windings are also used to provide starting torque in alternators.**

(a) II (b) III
(c) IV (d) I

**Ans. (a) :** Usually, damper winding are provided in salient pole type rotor alternators. It is not used in smooth cylindrical type rotor. Therefore statement 'II' is not true.

**Damper winding serve several important function:**
- These are useful in preventing the hunting in alternators.
- Under normal working condition, i.e., if machine is at synchronous speed, damper winding do not carry any currents.
- It is also used to provide starting torque in alternators.

**58. The operating point of a transistor known as _____.**

(a) active point (b) cut-off point
(c) threshold point (d) quiescent point

**Ans. (d) :** The operating point of a transistor is known as quiescent point, it is also called bias point or Q-point. It is the steady-state DC voltage or current at a specified terminal of an active device such as a transistor with no input signal applied.

**59. Two inductively coupled coils have self-inductance $L_1$=20H and $L_2$=320H. Find the maximum possible mutual inductance between the coils.**

(a) 100 H (b) 80 H
(c) 40 H (d) 10 H

**Ans. (b) :** Given that,
$L_1 = 20$ H
$L_2 = 320$ H
Coupling factor (K) = 1 (For maximum possible mutual inductance )

$$\text{Hence, } K = \frac{M}{\sqrt{L_1 L_2}}$$

$$\text{Mutual inductance (M)} = K\sqrt{L_1 L_2}$$
$$= 1\sqrt{20 \times 320}$$
$$= 80 \text{ H}$$

**60. A three-phase star-connected synchronous alternator of rating 22 kVA, 20 kV, 50 Hz has synchronous reactance of 8 Ω per phase. The induced voltage per phase is 20 kV and the line terminal voltage is 15 kV. Find the 3-phase maximum power of the machine.**

(a) 37.5 MW (b) 121. 5 MW
(c) 211.5 MW (d) 112.5 MW

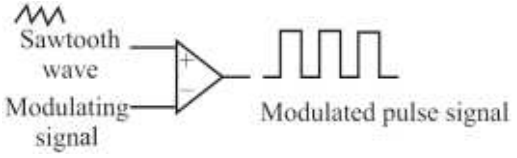
**Ans. (d) :** Given that,
For phase synchronous reactance ($X_S$) = 8Ω
Induced voltage per phase ($E_f$) = 20 kV
Terminal voltage ($V_t$) = 15 kV

$$3\text{-}\phi \text{ maximum power} = 3\frac{E_f V_t}{X_s}$$
$$= \frac{3 \times 20 \times 15}{8}$$
$$= 112.5 \text{ MW}$$

**61. Which modulation technique is commonly used in power modulators to achieve variable power output?**

(a) Amplitude modulation
(b) Pulse-width modulation
(c) Frequency modulation
(d) Delta modulation

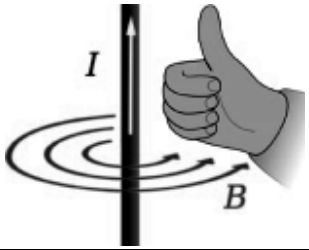
**Ans. (b) :** Pulse-width modulation technique is commonly used in power modulators to achieve variable power output. A pulse width modulating (PWM) signal is generated by using a comparator.




**62. In the context of electromagnetism, if a conductor is held in the right hand with the thumb pointing in the direction of the current, then the other fingers will point towards the _____.**

(a) current flowing through the conductor
(b) magnetic field intensity
(c) length of the conductor
(d) direction of the magnetic field

**Ans. (d) :** In the context of electromagnetism, if a conductor is held in the right hand with the thumb pointing in the direction of the current, then the other fingers will point towards the direction of the magnetic field.




**63. What is the formula for calculating the magnitude of the mechanical force experienced by a current-carrying conductor perpendicular to the magnetic field, where B = magnetic flux density, I = Current and L = Length of the conductor?**

(a) $F = \frac{B^2}{LI}$
(b) F = BIL
(c) $F=B^2LI$
(d) $F= BI^2L$

**Ans. (b) :** When a current carrying conductor perpendicular to the magnetic field, then, $\theta = 90^\circ$

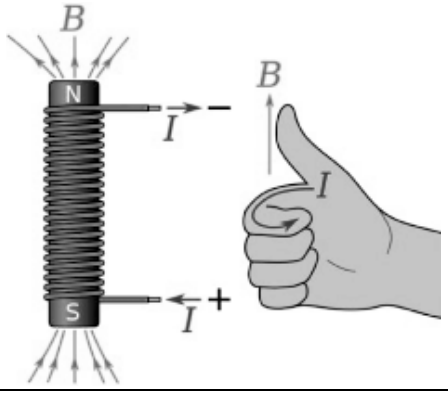
$\because$ force (F) = BIL $\sin\theta$

$F = BIL \quad (\because \sin 90^\circ = 1)$

**64. In the context of electromagnetism, the magnetic polarity of a coil of several turns can be determined by the _____.**

(a) left-hand rule
(b) mechanism of force production
(c) right-hand rule
(d) molecular theory

**Ans. (c) :** In the context of electromagnetism, the magnetic polarity of a coil of several turns can be determined by the right-hand rule.




**65. A coil having 100 turns is placed in the magnetic field of 1mwb. Find the average EMF induced if the coil is moved in 0.2 seconds from the given field to a field of 0.4mwb**

(a) 3 volts (b) 0.3 volt
(c) 10 volts (d) 30 volts

**Ans. (b) :** Given that,
Number of turns (N) = 100
Changes in flux (d$\phi$) = 1– 0.4 = 0.6 mWb
Changes in time (dt) = 0.2 second

$$EMF = N\frac{d\phi}{dt}$$

$$= 100 \times \frac{0.6 \times 10^{-3}}{0.2}$$

= 0.3 Volt

**66. What is the function of the pressure spring in a three-phase energy meter?**

(a) It moves the aluminium discs in response to the torque generated by the magnetic field.
(b) It provides mechanical support.
(c) It provides deflection torque to the moving member.
(d) It maintains a constant pressure between the aluminium discs and the disc spindles.

**Ans. (d) :** The function of the pressure spring in a three phase energy meter is that it maintains a constant pressure between the aluminium discs and the disc spindles.

**67. Consider the following statements regarding Brushless DC motors and select the correct option.**

**(i) In Brushless motors, there is a provision of permanent magnets that will rotate around a moving armature.**
**(ii) The brush-commutator assembly of a conventional DC motor is replaced by an electronic controller in the Brushless DC motors.**
**(iii) For same kW rating, the Brushless DC motor is less expensive than the Brushed conventional DC motor.**

(a) (i) and (ii) are false
(b) Only (ii) is false
(c) (ii) and (iii) are false
(d) (i) and (iii) are false

**Ans. (d) : Brushless DC motor:** A brushless DC electric motor is an electric motor powered by a direct current voltage supply and commutated electronically instead of brushes like in conventional DC motors.

**Advantages of BLDC motor:**

- It has offers longer lifetime due to the absence of brushes and commutator erosion.
- With no windings on the rotor, they are not subjected to centrifugal forces.
- High dynamic response
- High efficiency
- Noiseless operation
- Higher speed ranges

**Disadvantage**

- Requires complex drive circuitry
- Higher cost
- Requires additional sensors
- Some designs require manual labor

Therefore, statement (i) and (iii) are false.

**68. Which of the following materials is widely used for high-temperature heating (1500ºC) applications such as in industrial furnaces and kilns?**

(a) Bronze
(b) Silicon carbide
(c) Stainless steel
(d) Nickel chromium alloy

**Ans. (b) :** Silicon carbide is widely used for high temperature heating (1500ºC) application such as in industrial furnaces and kilns.

| Metals | Melting points (in ºC) |
|---|---|
| Bronze | 950 |
| Silicon carbide | 2730 |
| Stainless steel | 1400 to 1530 |
| Nickel chromium alloy | 1400 |
| Copper | 1084 |
| Aluminium | 658.6 |
| Silver | 961 |
| Tungsten | 3390 |

**69. In regard to estimation and costing of public lighting, which of the following factors is NOT a fundamental criterion for the quality of public lighting?**

(a) Optical guidance
(b) Level of luminance
(c) Looping-in method
(d) Limitations of glare

**Ans. (c) :** In regard to estimation and costing of public lighting, looping method is not a fundamental criterion for the quality of public lighting.

- In this method, the connection to light or fan is made by carrying around the circuit, from one point to another in a series of loops until the last circuit is reached.

**70. A 400 V, 30 kVA, single-phase alternator has an effective armature resistance of 0.3 Ω. An excitation current of 20A produces 266 A armature current on short-circuit and an EMF of 400 V on open-circuit. The synchronous impedance and synchronous reactance of the alternator are, respectively, _____.**

(a) 20 Ω and 0.3 Ω
(b) 1.46 Ω and 1.5 Ω
(c) 1.5 Ω and 1.46 Ω
(d) 0.3 Ω and 20 Ω

**Ans. (c) :** For a synchronous motor synchronous impedance can be defined as the ratio of open circuit voltage to the short circuit current

Given that,
Open circuit voltage ($V_{OC}$) = 400V
Short circuit current ($I_{SC}$) = 266 A
Armature resistance ($R_a$) = 0.3 Ω
Then,

$$\text{Synchronous impedance } (Z_s) = \frac{V_{OC}}{I_{SC}} = \frac{400}{266} = 1.5\Omega$$

$$\text{Synchronous reactance } (X_s) = \sqrt{Z_s^2 - R_a^2}$$

$$= \sqrt{(1.5)^2 - (0.3)^2}$$

$$= 1.46\ \Omega$$

**71. In case of installations in commercial buildings, evenly distributed lights can be obtained by the use of lenses, which reduces _____.**

(a) decoration (b) colour
(c) brightness (d) spot light

**Ans. (c) :** In case of installation in commercial buildings evenly distributed lights can be obtained by the use of lenses, which reduces brightness.

- To prevent excessive brightness indirect type of lighting scheme is used.
- A lens is commonly used to block direct viewing of a light source.
- Indirect lighting can create a low glare environment.

**72. A moving iron ammeter with a range of 0 to 1 amps has an internal resistance of 50 mΩ and an inductance of 0.1mH. To increase the range to 0-10 Ampere for all operational frequencies, a shunt coil is connected. The shunt coils resistance in mΩ and time constant in milliseconds are each given as:**

(a) 5.55, 2 (b) 2; 1
(c) 11.1; 2 (d) 2; 0.55

**Ans. (a) :** For a moving iron ammeter,
Given that,
$I_m$ = 1 A
$R_m$ = 50 mΩ
$L_m$ = 0.1 mH
After increasing range (I) = 10 A

$$R_{sh} = \frac{R_m}{\left(\frac{I}{I_m} - 1\right)} = \frac{50}{\left(\frac{10}{1} - 1\right)} = 5.55\text{m}\Omega$$

$$\text{Time constant } (\tau) = \frac{L_m}{R_m} = \frac{0.1}{50} = 2\,\text{msec.}$$

**73. In order to prevent creeping in an energy meter, which of the following measures is adopted?**

(a) Two, diametrically opposite holes are drilled on the aluminium disc.
(b) A temperature shunt is used on the brake magnet.

(c) A shading band is provided on the central limb of the shunt magnet.
(d) Two, diametrically opposite holes are drilled on the central limb.

**Ans. (a) :** In order to prevent creeping in an energy meter, two diametrically opposite holes are drilled on the aluminium disc.

**Creeping**:- Creeping in the induction type energy meter is the phenomenon in which the aluminium disc rotates continuously when only the voltage is supplied to the pressure coil and no current flows through the current coil.

- Under the light load condition it increases the speed of disc.
- Stray magnetic field and the extra voltage across the potential coil are also responsible for the creeping.

**74. When is the error under testing of energy meter directly obtained?**

(a) The meter under test and the rotating substandard meter constants are different.
(b) The meter under test and the rotating substandard meter constants are same.
(c) The meter under test and the rotating substandard meter constants are zero.
(d) The meter under test and the rotating substandard meter constants are 1.

**Ans. (b) :** The error under testing of energy meter directly obtained when the meter under test and the rotating substandard meter constants are same.

**Types of error in energy meter-**

(i) Phase error (ii) Speed error
(iii) Friction error (iv) Temperature error
(v) Creeping error

**75. A coil of inductance 10 H and resistance 40 ohm is connected in series with a capacitance and supplied by a source of variable frequency. If the maximum current is found at frequency 1000 rad/sec, then Q-factor of the circuit will be _____.**

(a) 100 (b) 200
(c) 25 (d) 250

**Ans. (d) :** Given that,
Inductance (L) = 10 H
Resistance (R) = 40Ω
In series resonance the current is maximum at resonance frequency.

$$\omega = 1000\,\text{rad/sec}$$

$$\text{Q-factor} = \frac{\omega L}{R}$$

$$= \frac{1000 \times 10}{40}$$

$$= 250$$

**76. Which of the following statements related to the speed control of DC shunt and series motors is correct?**

(a) In the Rheostatic control methods of shunt motors, the series resistor must be connected between the line and the motor.
(b) In a tapped field control when all the field turns are present in the circuit, the motor runs at the lowest speed.
(c) Field diverters and tapped field control methods are mostly used in DC shunt motors.
(d) In series-parallel control, the motors are joined in parallel at lower speeds and series at higher speeds.

**Ans. (b) : Speed control of DC shunt and series motor by tapped field control method-**

In this method, the speed is increased by reducing the flux and it is done by lowering number of turns of field winding. When all the field turns are present in the circuit, the motor runs at the lowest speed.

**77. A Kaplan turbine is used for _____.**

(a) low heads and large quantities of water
(b) high heads and large quantities of water
(c) low heads and low quantities of water
(d) high heads and low quantities of water

**Ans. (a) :** Kaplan turbine is used for low heads and large quantities of water.

**Kaplan turbine:**

- It is a reaction type turbine.
- It is used for low head and large quantities of water.
- In this turbine water strike the turbine axially.
- It has high specific speed.
- Lower cost of runner and alternator
- Its runner is capable of reverse operation as a pump.

**78. The value of inductance needed to store 4kWh of energy in a coil carrying a 2000A current is:**

(a) $7.2 \times 10^6$ H (b) 7.2 H
(c) 720 H (d) 72 H

**Ans. (b) :** Given that,
Stored energy in a inductor = $4\times10^3\times3600$ watt-sec.
Current (I) = 2000A

$$\text{Stored energy} = \frac{1}{2}LI^2$$

$$4\times10^3\times3600 = \frac{1}{2}\times L\times2000\times2000$$

L = 7.2 H

**79. During the tender in estimation and costing, the guarantee of the tenderer to deposit the required security and enter in to the required agreement on intimation of the acceptance of his tender is called _____.**

(a) deposit money
(b) earned money
(c) earnest money
(d) valid money

**Ans. (c) :** During the tender in estimation and costing, the guarantee of the tenderer to deposit the required security and enter into the required agreement on intimation of the acceptance of his tender is called earnest money.

- Earnest money is generally 2% of the tender value.

**80. If the speed of a 3-phase, 400 V, 50 Hz synchronous motor is trebled, the efficiency of the machine will _____.**

(a) become 3 times
(b) become zero
(c) reduce to one-third
(d) remain constant

**Ans. (d) :** If the speed of a 3-phase, 400V, 50 Hz synchronous motor is trebled, the efficiency of the machine will remain constant.

**Synchronous motor-**

The motor which runs at synchronous speed is known as synchronous motor. A synchronous motor converts electrical energy into mechanical energy. Synchronous motors are widely used in the industry for high precession applications.

**81. A Lissajous patterns on a Cathode Ray Oscilloscope (CRO) has 8 vertical maximum values and 4 horizontal maximum values. The frequency of the horizontal input is 1600 Hz. Determine the frequency of the vertical input?**

(a) 200 Hz (b) 800 Hz
(c) 600 Hz (d) 400 Hz

**Ans. (b) :** Given that,

Frequency of horizontal input = 1600 Hz

Vertical maximum value ($N_V$) = 8

Horizontal maximum value ($N_H$) = 4

According to Lissajous patterns-

$$\frac{f_V}{f_H} = \frac{N_H}{N_V}$$

$$\frac{f_V}{1600} = \frac{4}{8}$$

Frequency of vertical input ($f_V$) = 800 Hz

**82. Which of the following is NOT correct with reference to delta-star type distribution transformers application?**

(a) In delta-star type transformer, no distortion is produced by third harmonic components.
(b) In delta-star type transformer, large, unbalanced loads can be handled without any difficulty.
(c) In delta-star type transformer, fault protection is one of the primary advantages.
(d) In delta-star type transformer, secondary voltage is in phase with the primary voltages.

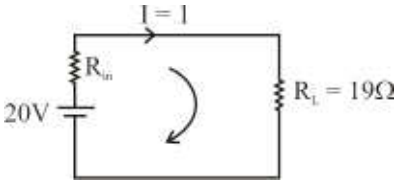
**Ans. (d) : Delta star type distribution transformer-**

- There are no distortion produced by third harmonic component.
- Large unbalanced loads can be handled without any difficulty.
- The main use of this connection is to step-up the voltage i.e. at the beginning of high tension transmission system.
- It can be noted that there is a phase shift of 30º between primary line voltage and secondary line voltage as leading.

**83. A battery source of 20 V when connected to a load of 19 Ω draws a current of 1 A. What is the value of internal resistance of battery?**

(a) 1 Ω (b) 39 Ω
(c) 0.5 Ω (d) 2 Ω

**Ans. (a) :** According to question-




Apply KVL,

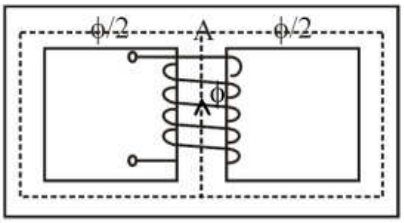
$$\frac{20}{19 + R_{in}} = 1$$

$R_{in} = 1\Omega$

**84. In electromagnetism of parallel magnetic circuits, the reluctance offered for two parallel paths will be _____.**

(a) half for each path
(b) quarter for each path
(c) cube for each path
(d) square for each path

**Ans. (a) :** In electromagnetism of parallel magnetic circuits, the reluctance offered for two parallel paths will be half for each path.




The flux produced by the coil wound on the central core is divided equally at point A between the two outer parallel paths.

**85. The torque developed in the squirrel cage induction motor with auto-starter is _____.**

(a) K/torque with direct switching
(b) K × torque with direct switching
(c) $K^2$/torque with direct switching
(d) $K^2$ × torque with direct switching

**Ans. (d) : Direct online starter:**

$$\frac{T_{st}}{T_{fl}} = \left(\frac{I_{st}}{I_{fl}}\right)^2 S_f$$

**Where,** $T_{st} \rightarrow$ Starting torque
$T_{fl} \rightarrow$ Full load torque
$I_{st} \rightarrow$ Starting current
$I_{fl} \rightarrow$ Full load current
$S_f \rightarrow$ full load slip

**Note:** It is used upto 5 H.P. motor.

**Auto transformer starter:**

$$\frac{T_{st}}{T_{fl}} = K^2\left(\frac{I_{st}}{I_{fl}}\right)S_f$$

Where, $K \rightarrow$ Tapping of transformation ratio

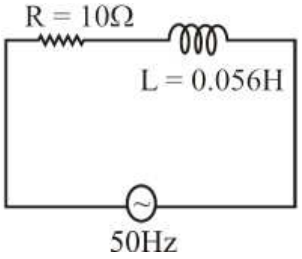
**Note:** It is used above 20 H.P. machine.

So, the torque developed in the squirrel cage induction motor with auto-transformer starter is $K^2\times$torque with direct switching.

**86. An R-L series circuit, where R = 10 Ω and L = 0.056 H, is connected to an AC supply of frequency 50 Hz. The magnitude of impedance of the circuit is:**

(a) 5.23 Ω (b) 10.23 Ω
(c) 20.23 Ω (d) 30.23 Ω

**Ans. (c) :** According to question:




$$X_L = 2\pi fL = 2\times 3.14\times 50\times 0.056$$
$$= 17.58\Omega$$
$$Z = \sqrt{R^2 + X_L^2}$$
$$Z = \sqrt{10^2 + (17.58)^2}$$
$$Z = 20.23\Omega$$

**87. What will be the total active power consumed by a 3-phase, delta-connected system, which is supplied with a line voltage of 230 V, when the value of the phase current is 15 A and the current lags the voltage by 30º?**

(a) 10.25 kW (b) 12.26 kW
(c) 8.963 kW (d) 14.63 kW

**Ans. (c) : For delta connected system:**

$V_L = V_{ph}$

$I_L = \sqrt{3}\, I_{ph}$

Given that,

$V_L = V_{ph} = 230V$

$I_{Ph} = 15$ A

$\phi = 30^o$

3- $\phi$ Active power (P) = $3V_pI_p\cos\phi$
$= 3\times 230\times 15\times \cos 30^o$
$= 8.963$ kW

**88. Identify the INCORRECT statement regarding a nuclear power plant.**

(a) The fuel rods contain pellets of uranium.
(b) Graphite and Boron carbides are used as control rods.
(c) Heavy water can be used as a coolant.
(d) The ordinary water is used as a moderator only after it is enriched with uranium.

**Ans. (b) : Nuclear power plant:**

- It is used as a base load plant.
- These plants are located away from the populated area.
- Initial cost is highest compared to other power plant.

**Moderator:** Slow down the speed of neutron.
**Example:** Graphite, Beryllium etc.
**Control rod:** Controlling the rate of fission of $U^{235}$.
**Example:** Boron, Cadmium or Hafnium.
**Coolant:** It is a medium through which heat generated in the reactor is transferred to heat exchanger for further utilization in power generation.
**Example:** Molten Na, Li and heavy water.

**89. Which of the following statements is correct?**

(a) The location of the fault in overhead lines can be found easily.
(b) The possibility of supply interruption due to lightning is more with underground cables.
(c) Overhead lines are more costly as compared to underground cables.
(d) Fault can be easily located in underground cables.

**Ans. (a) :** The location of fault in overhead lines can be found easily.

**Comparison between overhead & underground system:**

| Basic of comparison | Overhead system | Underground system |
|---|---|---|
| Initial cost | Low | High |
| Highest working voltage | AC-765 kV DC-800 kV | 132 kV |
| Fault location & repairing | Easy | Difficult |
| Maintenance cost | High | Low |
| Voltage drop | High because L is effective | Low because C is effective |
| Charging current | Less | More |

**90. Which of the following statements is/are true regarding symmetrical balanced three phase supply:**

**1. Instantaneous values of power in all of the 3 phases become zero at same instant.**

**2. Phase displacement between different phases of an n-phase system is $\left(\frac{360}{n}\right)^{\circ}$ electrical except for the two-phase system.**

(a) Only 2 (b) Only 1
(c) Neither 1 nor 2 (d) Both 1 and 2

**Ans. (a) :** In symmetrical balanced three phase supply phase displacement between different phases of an n-phase system is $\left(\frac{360}{n}\right)^{0}$ electrical except for the two phase system.

- In a 3-ϕ system, the total 3-ϕ instantaneous power is constant and equal to 3 times of power per phase.

Hence, only statement (2) is true.

**91. A 4Ω resistor has a specified maximum power dissipation of 784 W. Calculate its maximum current level.**

(a) 16 A (b) 14 A
(c) 196 A (d) 10 A

**Ans. (b) :** Given that,
Resistance (R) = 4Ω
Maximum power dissipation (P) = 784 W

$$I = \sqrt{\frac{P}{R}}$$
$$= \sqrt{\frac{784}{4}}$$
$$= \sqrt{196}$$
$$= 14A$$

**92. Which of the following statements is correct about inert gas metal arc welding?**

(a) In this method, concentration of heat is difficult.
(b) This method is particularly suitable for welding heavy metals.
(c) In this method, concentration of heat is easily possible.
(d) In this method, flux is required.

**Ans. (c) : Metal inert gas (MIG) Arc welding:**
MIG welding is an arc welding process that uses a continuous solid wire electrode heated and fed into the weld pool from a welding gun. The two base material are melted together forming joint.

- It uses a fresh metal electrode which is protected by the gas like helium, argon etc.
- In this welding a filler wire can be fed constantly using a consumable metal electrode for welding the metal.
- In this method, concentration of heat is easily possible.

**93. Select the correct statement for a medium overhead transmission line.**

(a) Load current is directly proportional to the square of load power factor.
(b) Load current is inversely proportional to the square of load power factor.
(c) Load current is directly proportional to the load power factor.
(d) Load current is inversely proportional to the load power factor.

**Ans. (d) :** We know that,

$$P = V_L I_L \cos\phi$$
$$I_L = \frac{P}{V_L \cos\phi}$$
$$I_L \propto \frac{1}{\cos\phi}$$

For a medium overhead transmission line load current is inversely proportional to the load power factor.

**94. To prevent rusting in electric iron, the plates of the bottom surface and edges are made of**

(a) mica (b) heavy iron
(c) asbestos (d) heavy chromium

**Ans. (d) :** To prevent rusting in electric iron, the plates of the bottom surface and edges are made of heavy chromium.
Rusting of iron refers to the formation of rust, a mixture of iron oxides, on the surface of iron objects or structures. This rust is formed from a redox reaction between oxygen and iron in an environment containing water.

**95. Which of the following statements is/are true regarding the principle of operation of a switched reluctance motor?**

**(1) The motor relies on the interaction of magnetic fields to produce rotational motion.**

**(2) The motor uses brushes and a commutator to produce rotational motion.**

**(3) The motor uses permanent magnets to produce rotational motion.**

**(4) The motor uses a series of switches to control the flow of current through its coils.**

(a) Both 1 and 3 (b) Both 2 and 4
(c) Both 1 and 2 (d) Only 1

**Ans. (d) : Switched reluctance motor:**
- The motor relies on the interaction of magnetic field to produce rotational motion.
- It is a stepper motor with closed loop control and with rotor position sensor.
- It is a doubly salient, singly excited moor.
- It is designed for high speed and the closed loop system is necessary.

**96. In the estimation and costing of public installations, which of the following factors is required, especially in long stretches of the road and even more on complicated intersections?**

(a) Limitations of glare
(b) Width of illumination Limitation of glare
(c) Level of luminance
(d) Visual guidance

**Ans. (d) :** In the estimation and costing of public installations, visual guidance is required, especially in long stretches of the road and even more on complicated intersections.

**97. The value of a series resistor required to limit the current through an electric bulb to 40 mA with a forward voltage drop of 4V when connected to 16 V supply is _____.**

(a) 100 Ω (b) 300 Ω
(c) 20 Ω (d) 1000 Ω

**Ans. (b) :** We know that,

$$R = \frac{V_s - V_c}{I}$$

Where, $V_s \rightarrow$ source voltage

$V_c \rightarrow$ cut in voltage

$R \rightarrow$ series resistor

Given that,

$V_s = 16V$, $V_c = 4V$, $I = 40$ mA

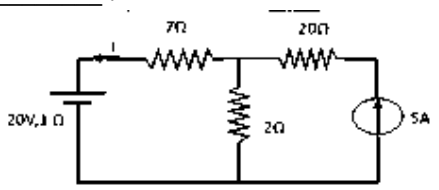
$$R = \frac{16-4}{40\times10^{-3}} = 300\Omega$$

**98. Which of the following types of materials shows a movement from a weaker region to a stronger region of a non-uniform magnetic field?**

(a) Diamagnetic material
(b) Non-magnetic material
(c) Insulating material
(d) Paramagnetic material

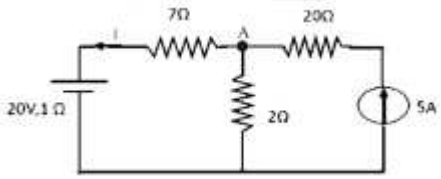
**Ans. (d) : Paramagnetic material:**
- It shows a movement from a weaker region to a stronger region of a non-uniform magnetic field.
- The substances are weakly attracted by the magnetic field.
- Magnetic susceptibility is small and positive.
- The relative permeability is slightly greater than 1.

**99. In the circuit shown here, the 20 V source has an internal resistance of 1 Ω. While the current source is ideal, the value of current I is _____.**




(a) 10 A (b) −1A
(c) 1A (d) 5A

**Ans. (b) :** According to question-




Applying KCL at node 'A'-

$$5 = \frac{V_A - 20}{8} + \frac{V_A}{2}$$

$V_A = 12V$

$$I = \frac{12-20}{8} = \frac{-8}{8} = -1A$$

**100. What is the advantage of using the current grading in relay systems?**

(a) It ensures quick tripping of the faulty circuit.
(b) It improves the frequency stability of the power system.
(c) It overcomes the long time delays occurring in graded time lag systems.
(d) It reduces the impedance between two sub-stations.

**Ans. (c) : Grading of over current relays:**

It is a adjustment of the settlings of the over current relays to ensure discrimination and selectivity. An over current protection relay is installed at every breaker location. When a fault occurs at any given point, only the relay located closest to the fault should operate. This is known as grading.

**There are three types of grading:**

1. Current grading
2. Time grading
3. Time-current grading

**Current grading :** It is refers to the discrimination achieved by reducing the current settling as we move towards the power source. This ensures that the relay closest to the fault trips first.

**Advantage:**

It overcomes the long time delays occurring in graded time lag systems.