

SSC JE Electrical Engineering Online Exam 2024

CPWD/CWC/MES

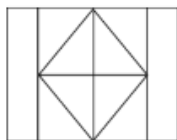
Paper-I (Pre)

Date : 05.06.2024

Timing : 05:00 PM - 07:00 PM

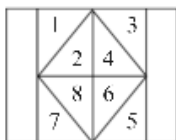
General Intelligence and Reasoning

1. How many triangles are there in the given figure?



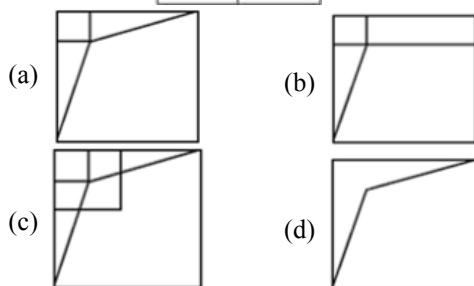
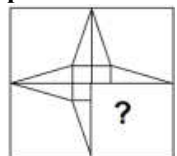
- (a) 14 (b) 18
(c) 16 (d) 12

Ans. (d) :



The number of triangles made by one digit = 8
The number of triangles made by two digit = (2, 4), (8, 6), (2, 8), (4, 6) = 4
Hence, the total number of triangles = 8 + 4 = 12

2. Select the option figure that will replace the question mark (?) in the figure given below to complete the pattern.



Ans. (a) : Figure given in option (a) will complete the pattern of question figure.

3. Which two numbers should be interchanged to make the given equation correct?
 $(176 \div 4) + (22 \times 8) - (2 \times 20) = 70$
(Note : Interchange should be done of entire number and not individual digits of a given number)
(a) 22 and 20 (b) 2 and 8
(c) 4 and 8 (d) 2 and 4

Ans. (c) : Given equation

$$(176 \div 4) + (22 \times 8) - (2 \times 20) = 70$$

On interchanging the number 4 and 8 as per option (c),

$$(176 \div 8) + (22 \times 4) - (2 \times 20) = 70$$

$$22 + 88 - 40 = 70$$

$$110 - 40 = 70$$

$$70 = 70$$

$$\text{L.H.S.} = \text{R.H.S.}$$

4. Select the set in which the number are related in the same way as are the number 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. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

(12, 8, 28)

(34, 9, 52)

(a) 15, 25, 60 (b) (54, 13, 70)

(c) (49, 12, 71) (d) (62, 11, 84)

Ans. (d) : Just as,

$$(12, 8, 28) \Rightarrow 12 + 2 \times 8 = 28$$

$$\text{And } (34, 9, 52) \Rightarrow 34 + 2 \times 9 = 52$$

Similarly,

From option (d),

$$(62, 11, 84) \Rightarrow 62 + 11 \times 2 = 84$$

\therefore Option (d) will be correct.

5. In a certain code language,

'A + B' means 'A is the mother of B',

'A - B' means 'A is the brother of B',

'A \times B' means 'A is the wife of B', and

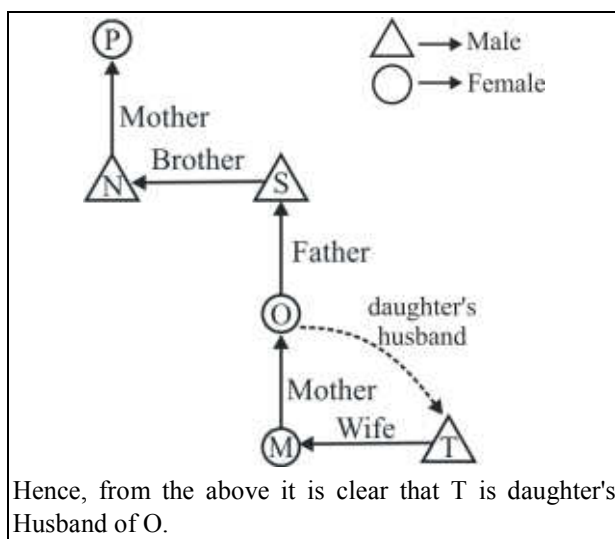
'A \div B' means 'A is the father of B'.

How is T related to O if 'P + N - S \div O + M \times T'?

- (a) Son's son
(b) Daughter's son
(c) Son
(d) Daughter's husband

Ans. (d) : According to the question, on the basis of given expression the blood relation diagram is as follows-





6. HGCA is related to LKGE in a certain way based on the English alphabetical order. In the same way, BKOM is related to FOSQ. To which of the following is NSJD related following the same logic?
- (a) LPRY (b) PLNH
(c) RWNH (d) HSRD

Ans. (c) : Just as,

H $\xrightarrow{+4}$ L
G $\xrightarrow{+4}$ K
C $\xrightarrow{+4}$ G
A $\xrightarrow{+4}$ E

And

B $\xrightarrow{+4}$ F
K $\xrightarrow{+4}$ O
O $\xrightarrow{+4}$ S
M $\xrightarrow{+4}$ Q

Same as,

N $\xrightarrow{+4}$ R
S $\xrightarrow{+4}$ W
J $\xrightarrow{+4}$ N
D $\xrightarrow{+4}$ H

7. KSNJ is related to MUPL in a certain way based on the English alphabetical order. In the same way, NVQM is related to PXSO. To which of the following is EMHD related, following the same logic?
- (a) GOJF (b) GOFJ
(c) OGJF (d) OGFJ

Ans. (a) : Just as,

K $\xrightarrow{+2}$ M
S $\xrightarrow{+2}$ U
N $\xrightarrow{+2}$ P
J $\xrightarrow{+2}$ L

And

N $\xrightarrow{+2}$ P
V $\xrightarrow{+2}$ X
Q $\xrightarrow{+2}$ S
M $\xrightarrow{+2}$ O

Same as,

E $\xrightarrow{+2}$ G
M $\xrightarrow{+2}$ O
H $\xrightarrow{+2}$ J
D $\xrightarrow{+2}$ F

8. Select the correct option that indicates the arrangement of the following words in a logical and meaningful order.

- (1) House
(2) Curtain
(3) Window
(4) Room
(5) Wall

- (a) 1, 3, 4, 2, 5 (b) 1, 5, 2, 4, 3
(c) 1, 2, 3, 5, 4 (d) 1, 4, 5, 3, 2

Ans. (d) : The logical and meaningful order of the given words is as follows-

1. House, 4. Room, 5. Wall, 3. Window, 2. Curtain

Hence, correct order will be 1, 4, 5, 3, 2.

9. If A means +, B means -, C means \times and D means \div , then what will come in place of the question mark (?) in the following equation?

21 A 18 D 2 B 3 C 5 = ?

- (a) 14 (b) 16
(c) 17 (d) 15

Ans. (d) : The given equation is-

21 A 18 D 2 B 3 C 5 = ?

On replacing the signs as per the question,

21 + 18 \div 2 - 3 \times 5 = ?

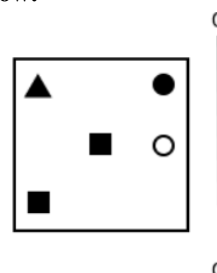
21 + 9 - 3 \times 5 = ?

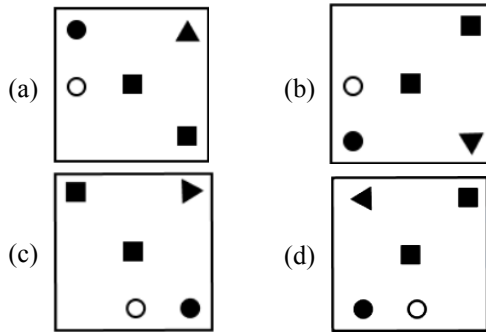
21 + 9 - 15 = ?

30 - 15 = ?

$\boxed{? = 15}$

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





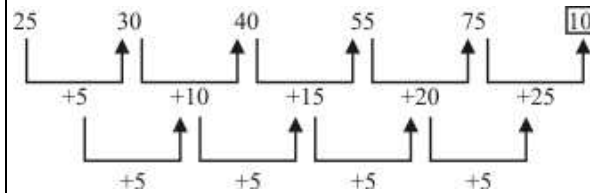
Ans. (a) : Figure, given in option (a) will be the correct mirror image of question figure.

11. What should come in place of the question mark (?) in the given series?

25, 30, 40, 55, 75, ?

- (a) 95 (b) 90
(c) 105 (d) 100

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



Hence ? = 105

12. In a certain code language, 'he was good' is coded as 'ik bu oy' and 'was she there' is coded as 'bu ha no'. How is 'was' coded in the given language?

- (a) ha (b) no
(c) bu (d) ik

Ans. (c) : According to the question,

he was good = ik bu oy

was she there = bu ha no

It is clear from above that 'was' is coded as 'bu' in the given language.

13. In a certain code language 'TAKERS' is coded as '045%^1' and 'TALKER' is coded as '1*450%'. What is the code for 'L' in the given code language?

- (a) * (b) ^
(c) 5 (d) 0

Ans. (a) : In the given words 'TAKERS' and 'TALKER' the letters T, A, K, E, R are common and in their codes 0, 4, 5, %, 1 are also common.

So it is clear that the code for L is '*'.

14. The position of how many letters will remain unchanged if each of the letters in the word CLOSURE is arranged in the English alphabetical order?

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

Ans. (a) : On arranging each letters of the given word in English Alphabetical order,

C L O S U R E
C E L O R S U

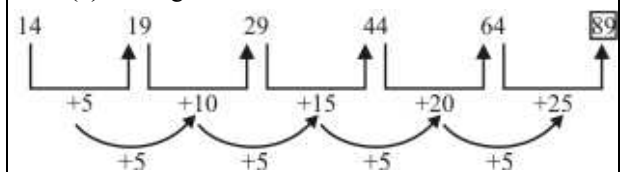
Hence from the above it is clear that position of 'one' letter will remain unchanged.

15. What should come in place of the question mark (?) in the given series?

14, 19, 29, 44, 64, ?

- (a) 89 (b) 84
(c) 82 (d) 88

Ans. (a) : The given number series is as follows :-



16. In a certain code language, 'BANISH' is coded as '9' and 'AMORPHOUS' is coded as '12'. What is the code for 'AMNESTY' in the given language?

- (a) 9 (b) 16
(c) 10 (d) 11

Ans. (c) :

Just as,

BANISH

↓

Number of letters + 3
6 + 3 = 9

Similarly,

AMNESTY

↓

Number of letters + 3
7 + 3 = 10

And

AMORPHOUS

↓

Number of letters + 3
9 + 3 = 12

17. MK 4 is related to OM 2 in a certain way. In the same way, QS 6 is related to SU 3. To which of the following is XU 8 related, following the same logic?

- (a) ST 5 (b) ZW 4
(c) GX 5 (d) XE 7

Ans. (b) : Just as,

M $\xrightarrow{+2}$ O
K $\xrightarrow{+2}$ M
4 $\xrightarrow{+2}$ 2

and

Q $\xrightarrow{+2}$ S
S $\xrightarrow{+2}$ U
6 $\xrightarrow{+2}$ 3



Same as,

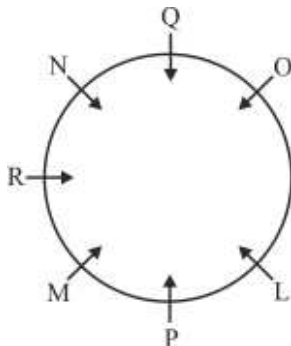
$$\begin{array}{ccc} X & \xrightarrow{+2} & Z \\ U & \xrightarrow{+2} & W \\ 8 & \xrightarrow{+2} & 4 \end{array}$$

18. L, M, N, O, P, Q and R are sitting around a circular table, facing the centre. L sits second to the right of M. N sits third to the right of L. O sits second to the left of N. P is not an immediate neighbor of N. Q sits to the immediate right of O.

How many people are sitting between L and R when counted from the left of L?

- (a) Two (b) Three
(c) Zero (d) One

Ans. (a) : According to the question, Sitting arrangement around circular table is as follows :-



It is clear from sitting arrangement that 'Two' people sits between L and R on counting from left of L.

19. What should come in place of the question mark (?) in the given based on the English alphabetical order?

HLP, TXB, FJN, RVZ, DHL, ?

- (a) QSX (b) PTX
(c) PTY (d) QTY

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

$$\begin{array}{cccccccc} H & \xrightarrow{+12} & T & \xrightarrow{+12} & F & \xrightarrow{+12} & R & \xrightarrow{+12} & D & \xrightarrow{+12} & P \\ L & \xrightarrow{+12} & X & \xrightarrow{+12} & J & \xrightarrow{+12} & V & \xrightarrow{+12} & H & \xrightarrow{+12} & T \\ P & \xrightarrow{+12} & B & \xrightarrow{+12} & N & \xrightarrow{+12} & Z & \xrightarrow{+12} & L & \xrightarrow{+12} & X \end{array}$$

Hence PTX

20. What will come in place of the question mark (?) in the following equation if '+' and '-' are interchanged?

$$63 \div 9 - 14 \times 11 + 28 = ?$$

- (a) 138 (b) 135
(c) 129 (d) 133

Ans. (d) : Given equation-

$$63 \div 9 - 14 \times 11 + 28 = ?$$

On interchanging the sign + and - in the given equation

$$63 \div 9 + 14 \times 11 - 28 = ?$$

$$7 + 14 \times 11 - 28 = ?$$

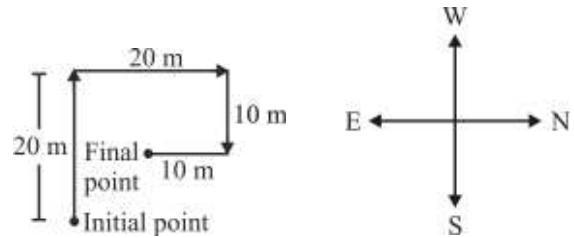
$$7 + 154 - 28 = ?$$

$$133 = ?$$

21. Rahul walked 20 m towards the north. Then he turned right and walked 20 m. Then he turned right and walked 10 m. He then turned right and walked 10 m. In what directions is he headed?

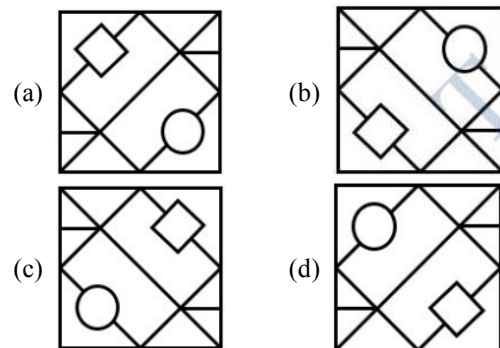
- (a) East (b) North
(c) West (d) South

Ans. (c) : According to the question the path order of Rahul is as follows-



From the above it is clear that Rahul is headed in 'west' direction.

22. 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).

23. Select the set in which the numbers are related in the same way as are the number 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. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on a and 3 is not allowed.)



(120, 96, 54)

(108, 84, 42)

(a) (128, 96, 60)

(b) (92, 68, 40)

(c) (116, 92, 62)

(d) (124, 100, 58)

Ans. (d) : Just as,

(120, 96, 54)

$$120 \xrightarrow{-24} 96 \xrightarrow{-42} 54$$

And

(108, 84, 42)

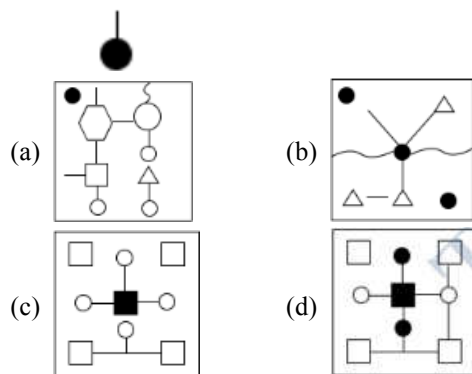
$$108 \xrightarrow{-24} 84 \xrightarrow{-42} 42$$

Same as, from option (d)

(124, 100, 58)

$$124 \xrightarrow{-24} 100 \xrightarrow{-42} 58$$

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



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

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

100 : 20

60 : 12

(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 then performing mathematical operations on 1 and 3 is NOT allowed.)

(a) 120 : 12

(b) 45 : 9

(c) 54 : 6

(d) 144 : 12

Ans. (b) : Just as,

$$100 : 20 \Rightarrow \frac{100}{5} = 20$$

And,

$$60 : 12 \Rightarrow \frac{60}{5} = 12$$

Same as,

From option (b)

$$45 : 9 \Rightarrow \frac{45}{5} = 9$$

26. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

SVX, QTV, ORT, MPR, ?

(a) KMP

(b) NRP

(c) KNP

(d) LOR

Ans. (c) : The given letter series is as follows :-

S	$\xrightarrow{-2}$	Q	$\xrightarrow{-2}$	O	$\xrightarrow{-2}$	M	$\xrightarrow{-2}$	K
V	$\xrightarrow{-2}$	T	$\xrightarrow{-2}$	R	$\xrightarrow{-2}$	P	$\xrightarrow{-2}$	N
X	$\xrightarrow{-2}$	V	$\xrightarrow{-2}$	T	$\xrightarrow{-2}$	R	$\xrightarrow{-2}$	P

Hence $[\text{?} = \text{KNP}]$

27. L, M, N, O, P and Q are sitting around a circular table facing the centre (not necessarily in the same order). M is sitting to the immediate right of Q. L is sitting to the immediate left of O. Q is sitting to the immediate right of O. P is sitting to the immediate left of L. Who is sitting to the immediate right of M?

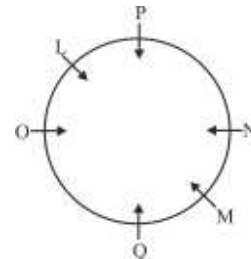
(a) N

(b) P

(c) L

(d) O

Ans. (a) : According to the question,



It is clear that N is sitting to the immediate right of M.

28. TILE is related to VLNH in a certain way based on the English alphabetical order. In the same way, RAMP is related to TDOS. To which of the following is SORT related, following the same logic?

(a) URTV

(b) URTW

(c) VRTV

(d) VRTW

Ans. (b) : Just as,

T	$\xrightarrow{+2}$	V
I	$\xrightarrow{+3}$	L
L	$\xrightarrow{+2}$	N
E	$\xrightarrow{+3}$	H



$$\begin{array}{ccc} \text{R} & \xrightarrow{+2} & \text{T} \\ \text{A} & \xrightarrow{+3} & \text{D} \\ \text{M} & \xrightarrow{+2} & \text{O} \\ \text{P} & \xrightarrow{+3} & \text{S} \end{array}$$
$$\begin{array}{ccc} \text{S} & \xrightarrow{+2} & \text{U} \\ \text{O} & \xrightarrow{+3} & \text{R} \\ \text{R} & \xrightarrow{+2} & \text{T} \\ \text{T} & \xrightarrow{+3} & \text{W} \end{array}$$

- (a) Only conclusion I follows.
(b) Both conclusion I and II follow.
(c) Neither conclusion I nor II follows.
(d) Only conclusion II follows.

A Venn diagram with two overlapping circles. The left circle is labeled 'Pen' and the right circle is labeled 'Blue'. The intersection of the two circles is labeled 'Red'.

(a) KKP (b) JPS
(c) IJQ (d) JIS

$$\begin{array}{ccccccccc} \text{S} & \xrightarrow{+4} & \text{W} & \xrightarrow{+4} & \text{A} & \xrightarrow{+4} & \text{E} & \xrightarrow{+4} & \text{I} \\ \text{T} & \xrightarrow{+4} & \text{X} & \xrightarrow{+4} & \text{B} & \xrightarrow{+4} & \text{F} & \xrightarrow{+4} & \text{J} \\ \text{A} & \xrightarrow{+4} & \text{E} & \xrightarrow{+4} & \text{I} & \xrightarrow{+4} & \text{M} & \xrightarrow{+4} & \text{O} \end{array}$$

Hence $\boxed{? = IJQ}$

- (NOTE : Operations should be performed on the whole numbers, without breaking down the numbers into its constituent digits E.g. 13-**

(a) 15 (b) 25
(c) 35 (d) 45

$$42, 14 \Rightarrow \frac{42}{3} = 14$$
$$33, 11 \Rightarrow \frac{33}{3} = 11$$
$$75, ? \Rightarrow \frac{75}{3} = 25$$
$$\boxed{? = 25}$$

- (a) Father's mother
(b) Father's mother's sister
(c) Mother's sister
(d) Mother's mother

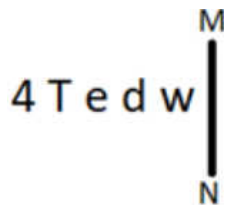
(a) (b)





Ans. (c) : Figure given in option (c) will complete the pattern of question figure.

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



- (a) *md eT 4* (b) *w b eT 4*
(c) *mp eT 4* (d) *w b eT 4*

Ans. (b) : The correct mirror image of the given figure when the mirror is placed at MN is option (b).

35. 42 is related to 21 following a certain logic. Following the same logic, 26 is related to 13. To which of the following is 68 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. 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) 30 (b) 32
(c) 34 (d) 36

Ans. (c) : Just as,

$$\frac{42}{2} = 21$$

And

$$\frac{26}{2} = 13$$

Similarly,

$$\frac{68}{2} = 34$$

Hence, 68 is related to 34.

36. GKHL is related to IMJN in a certain way based on the English alphabetical order. In the same way, KOLP is related to MQNR. To which of the following is NROS related, following the same logic?

- (a) PTUQ (b) PTQU
(c) TPQU (d) TPUQ

Ans. (b) : Just as,

G $\xrightarrow{+2}$ I
K $\xrightarrow{+2}$ M
H $\xrightarrow{+2}$ J
L $\xrightarrow{+2}$ N

And,

K $\xrightarrow{+2}$ M
O $\xrightarrow{+2}$ Q
L $\xrightarrow{+2}$ N
P $\xrightarrow{+2}$ R

Same as,

N $\xrightarrow{+2}$ P
R $\xrightarrow{+2}$ T
O $\xrightarrow{+2}$ Q
S $\xrightarrow{+2}$ U

37. What will come in place of the question mark (?) in the following equation if '+' and '-' are interchanged and 'x' and '÷' are interchanged?

$$20 \times 5 - 13 + 3 \div 4 = ?$$

- (a) 5 (b) 12
(c) 10 (d) 7

Ans. (a) : The given equation,

$$20 \times 5 - 13 + 3 \div 4 = ?$$

According to the question, on interchanging mathematical signs

$$20 \div 5 + 13 - 3 \times 4 = ?$$

$$4 + 13 - 12 = ?$$

$$4 + 1 = ?$$

$$\boxed{? = 5}$$

38. 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.)

Cockroach : Nymph

- (a) Sheep : Fawn
(b) Bear : Foal
(c) Swan : Cygnet
(d) Horse : Chick

Ans. (c) : Just as baby of a Cockroach is called Nymph. Same as baby of a Swan is called Cygnet.

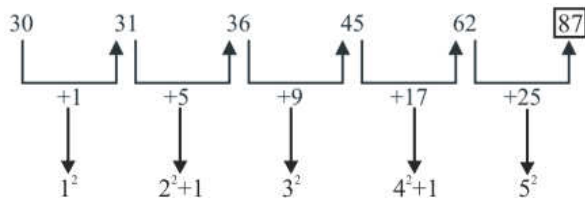
39. Which of the following numbers will replace the question mark (?) in the given series?

30, 31, 36, 45, 62, ?

- (a) 87 (b) 90
(c) 88 (d) 85



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



Hence $? = 87$

40. The position(s) of how many letters will remain unchanged if each of the letters in the word 'HANGOVER' is arranged in alphabetical order?

- (a) Four (b) Three
(c) Two (d) Zero

Ans. (d) :

On arranging the letters of given word HANGOVER in alphabetical order \rightarrow A E G H N O R V

It is clear that position of any letter will not remain unchanged. Hence option (d) will be the required answer.

41. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

RJG, NFC, JBY, FXU, ?

- (a) ATQ (b) ATP
(c) BTQ (d) BSQ

Ans. (c) : The given letter series is as follows :

R	$\xrightarrow{-4}$	N	$\xrightarrow{-4}$	J	$\xrightarrow{-4}$	F	$\xrightarrow{-4}$	B T Q
J	$\xrightarrow{-4}$	F	$\xrightarrow{-4}$	B	$\xrightarrow{-4}$	X	$\xrightarrow{-4}$	
G	$\xrightarrow{-4}$	C	$\xrightarrow{-4}$	Y	$\xrightarrow{-4}$	U	$\xrightarrow{-4}$	

Hence, $? = \text{BTQ}$

42. 16 is related to 225 following a certain logic. Following the same logic, 7 is related to 99. To which of the following is 11 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) 155 (b) 159
(c) 158 (d) 150

Ans. (a) : Just as,

$$16 \longrightarrow 16 \times 14 + 1 = 225$$

And

$$7 \longrightarrow 7 \times 14 + 1 = 99$$

Same as,

$$11 \longrightarrow 11 \times 14 + 1 = 155$$

Hence, option (a) will be required answer.

43. Read the given statements and conclusions carefully. You have to take the given statements to be true even if they seem to be at variance from commonly known facts. You have to decide which conclusion/s logically follow/s from the given statements.

Statements: Some horses are rocks. Some rocks are leaves. No rock is a tree.

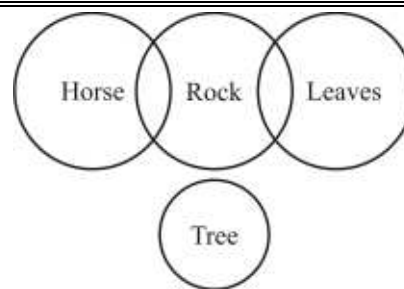
Conclusions:

(I) No horse is a tree.

(II) At least some leaves are trees.

- (a) Both conclusions (I) and (II) follow.
(b) Only conclusion (I) follows.
(c) Neither conclusion (I) nor (II) follows.
(d) Only conclusion (II) follows.

Ans. (c) : According to the statement venn-diagram is as follows-



From the above it is clear that neither conclusion (I) nor (II) follows.

44. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

MGA, HBV, CWQ, XRL, ?

- (a) SGM (b) SMG
(c) GMS (d) GSM

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

M	$\xrightarrow{-5}$	H	$\xrightarrow{-5}$	C	$\xrightarrow{-5}$	X	$\xrightarrow{-5}$	S
G	$\xrightarrow{-5}$	B	$\xrightarrow{-5}$	W	$\xrightarrow{-5}$	R	$\xrightarrow{-5}$	M
A	$\xrightarrow{-5}$	V	$\xrightarrow{-5}$	Q	$\xrightarrow{-5}$	L	$\xrightarrow{-5}$	G

Hence $? = \text{SMG}$

45. Select the correct option that indicates the arrangement of the following words in a logical and meaningful order.

1. School 2. Graduation
3. Birth 4. Doctorate
5. Under graduation

- (a) 3, 1, 5, 2, 4 (b) 1, 5, 3, 2, 4
(c) 4, 1, 3, 2, 5 (d) 3, 5, 1, 4, 2



Ans. (a) : The logical and meaningful order of the given words is as follows-

3. Birth 1. School 5. Under-graduation 2. Graduation
4. Doctorate

Hence 3, 1, 5, 2, 4 will be the required order.

46. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

HNL, JPN, LRP, NTR, ?

- (a) VPT (b) PVT
(c) VTP (d) PTV

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

H $\xrightarrow{+2}$ J $\xrightarrow{+2}$ L $\xrightarrow{+2}$ N $\xrightarrow{+2}$ P
N $\xrightarrow{+2}$ P $\xrightarrow{+2}$ R $\xrightarrow{+2}$ T $\xrightarrow{+2}$ V
L $\xrightarrow{+2}$ N $\xrightarrow{+2}$ P $\xrightarrow{+2}$ R $\xrightarrow{+2}$ T

Hence ? = PVT

47. FJGK is related to HLIM in a certain way based on the English alphabetical order. In the same way, IMJN is related to KOLP. To which of the following is OSPT related, following the same logic?

- (a) QVUR (b) QURV
(c) QUVR (d) QVRU

Ans. (b) : Just as

F $\xrightarrow{+2}$ H
J $\xrightarrow{+2}$ L
G $\xrightarrow{+2}$ I
K $\xrightarrow{+2}$ M

And

I $\xrightarrow{+2}$ K
M $\xrightarrow{+2}$ O
J $\xrightarrow{+2}$ L
N $\xrightarrow{+2}$ P

Same as,

O $\xrightarrow{+2}$ Q
S $\xrightarrow{+2}$ U
P $\xrightarrow{+2}$ R
T $\xrightarrow{+2}$ V

48. In a certain code language, 'HIDE' is coded as '3795' and 'DOWN' is coded as '4287'. What is the code for 'D' in the given code language?

- (a) 2 (b) 7
(c) 4 (d) 9

Ans. (b) : According to the question,

H I \triangle D E = 3 7 9 5

\triangle D O W N = 4 2 8 7

It is clear that D is coded as 7.

49. In a Zoological park, seven giraffes L, M, R, E, V, Z and Y have different heights. R is taller than E but shorter than Y. Z is taller than M but shorter than V. L is taller than R but shorter than V. Y is shorter than M but taller than E. M is shorter than Z. Which among the seven is the shortest?

- (a) R (b) E
(c) Y (d) L

Ans. (b) : According to the question order of length is as follows-

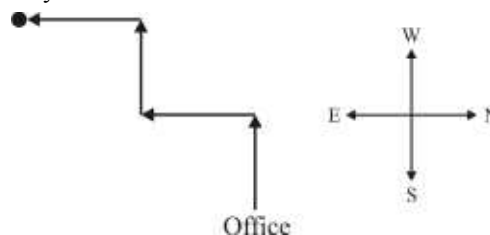
$V > Z > M > L / Y > Y / L > R > E$

It is clear from above that among the seven giraffes 'E' is the shortest.

50. Aishwarya starts from her office in north direction. She turns to her left then to her right and finally after walking some more, she turns to her left. In which direction is she facing now?

- (a) West
(b) North
(c) South
(d) East

Ans. (a) : According to the question, path order of Aishwarya is as follows-



It is clear from the above that now Aishwarya is facing 'West' direction.

General Awareness

1. Who along with Barry Marshall, was awarded the Nobel Prize in Physiology or Medicine in 2005 for discovering that stomach ulcer is an infectious disease caused by bacteria?
- (a) Jean Paul Vuillemin
(b) Robert Koch
(c) Gabriel Pouchet
(d) Robin Warren

Ans. (d) : Stomach ulcer is an infection disease caused by bacteria. In 2005 Robin warren, along with Barry Marshall was awarded the Nobel Prize in medicine for its discovery. Nobel Prizes are given every year in six categories- (1) Physics (2) Chemistry (3) Medicine (4) Peace (5) Economics (6) Literature.



2. In which Union Territory is the 'Slash and burn' agriculture known as 'Dipa' ?
- Ladakh
 - Jammu & Kashmir
 - Andaman and Nicobar Islands
 - Dadra & Nagar Haveli and Daman & Div

Ans. (c) : Slash and burn agriculture is called deepa in Andaman and Nicobar island. Slash and burn agriculture is a type of shifting cultivation in which a piece of land is selected for growing crops for a period of time and after the end of fertility that piece is abandoned and another piece is selected. There is natural vegetation growth back on the first selected piece.

Local Name of Shifting Cultivation	Area
Ray	vitenam
Tavi	Medagascar
Logan	West Africa
Ladang	Indonesia

3. Which species of sponges is commonly called glass sponge due to the presence of silica spicules?
- Euplectella
 - Spongilla
 - Planaria
 - Calcarea

Ans. (a) : Euplectella is a species of glass sponge, Due to presence of siliceous spicules they are called glass sponges. These are found in abundance in the deep sea. Their body is like a curved basket or vase.

4. What is the main content of the fourth schedule in the constitution of India ?
- Provisions for state legislature
 - Allocations of seats in the council of states
 - Directive Principles of state
 - Allocation of seats in the Lok Sabha

Ans. (b) : The Fourth schedule of the constitution of India deals with the allocation of seats in the Rajya Sabha. At present time there are 12 schedules in the constitution of India.

Schedules	Features
1 st schedule	The list of states and union territories
3 rd schedule	The forms of oaths or affirmation
8 th schedule	The list of recognized languages.

5. Who composed the music for the Kashmir Ki Kali ?
- OP Nayyar
 - Hemant kumar
 - Salil chaudhury
 - Naushad

Ans. (a) : The Hindi film "Kashmir ki Kali" was produced and directed by shakti samant in 1964. O.P. Nayyar is the musician of this film.

6. Which Minister led the Indian delegation in the meeting of the digital and technology ministers of G7 countries held in Japan on 29 and 30 April 2023?

- Ashwini Vaishnaw
- Ajay Bhatt
- Bhupendra Yadav
- Sarbananda Sonowal

Ans. (a) : Ashwini Vaishnav led the Indian delegation at the meeting of digital and Technology minister of G-7 countries to be held in Japan on April 29 and 30, 2023. The 50th G-7 summit was held in June 2024 in Italy. It was presided by Italy's Prime Minister Giorgia Meloni.

7. What was the main objection against the Directive principles of state policy in the constitution Assembly ?

- The state was responsible for these Policies.
- They were an instrument of instructions.
- They were non-justiciable in character.
- They were considered as novel features.

Ans. (c) : The main objection raised in the constituent Assembly against the directive principles of state policy they were not justifiable in character. Part-4 of the Indian constitution is related to the directive principles of state policy. The idea of directive principle of state policy has been taken from the constitution of Ireland.

8. Who among the following scientists discovered free living cells in pond water for the first time?

- Anton Van Leeuwenhoek
- Robert Brown
- Franz Bauer
- Robert Hooke

Ans. (a) : In 1674, Leeuwenhoek discovered free living cells in a pond with the help of a microscope. Leeuwenhoek first observed living cells such as human sperm, RBC, protozoa and bacteria. The alga spirogyra was the first living cell that he observed through a microscope.

9. Who is the ultimate interpreter of the constitution ?

- Supreme Court
- President
- Speaker
- District Courts

Ans. (a) : The supreme court is the final interpreter of the constitution. It has been the protector of our constitutional rights and fundamental freedoms through its creative and innovative interpretation under the Article 13, 32, 143, 226 and 246 supreme court can review any law.



10. **Meri LiFE” (My life) app was launched in May 2023 by union minister Shri Bhupender Yadav. Which ministry does he belong?**

- (a) Ministry of Earth Sciences
- (b) Ministry of Environment, Forest and Climate Change
- (c) Ministry of Agriculture and Farmers Welfare
- (d) Ministry of Health and Family Welfare

Ans. (b) : In may 2023 "My Life" app was launched by union Minister Bhupendra Yadav. Bhupendra Yadav is the Minister of Environment, Forest and Climate change in the Government of India.

11. **Food digested in the stomach passes through the intestines so that the blood vessels can absorb essential nutrients for the functioning and growth of the body. What is this process known as?**

- (a) Transmission
- (b) Assimilation
- (c) Transfusion
- (d) Integration

Ans. (b) : Food digested in the stomach passes through the intestines. So that the blood vessels can absorb the nutrients necessary for the functioning and growth of the body. This process is called assimilation.

12. **Who inspired Indians by raising the slogan 'Freedom is my birthright and I shall have it!'**

- (a) Swami Vivekananda
- (b) Sachindra Nath Sanyal
- (c) Bhagat Singh
- (d) Bal Gangadhar Tilak

Ans. (d) : Bal Gangadhar Tilak inspired Indians by giving the slogan "swaraj is my birthright and I shall have it". He is popularly called "Lokamanya". He founded the Home Rule league. Tilak joined congress in 1890. He Published two newspapers named kesari (in Marathi language) and Maratha (In English).

13. **According to Article 58 of the constitution of India, no person shall be eligible for election as president unless he is a citizen of India, has completed the age of ——— and is qualified for election as a member of the house of the people.**

- (a) 27 years
- (b) 30 years
- (c) 35 years
- (d) 40 years

Ans. (c) : Article 58 of the Indian constitution states the Policies that deal with the qualification for election as a president of the country. It states that no individual can be elected as the president of India unless they are 35 years of age and are a citizen of India.

14. **Based on which committee recommendations, RBI introduced a comprehensive regulatory framework for NBFC-MFIs?**

- (a) Gadgil committee
- (b) Malegam committee
- (c) Kelkar committee
- (d) Rangarajan committee

Ans. (b) : On the recommendation of the malegam committee, RBI introduced a comprehensive regulatory framework for NBFC-MFIs. RBI constituted a committee in 2010 to look into micro finance sector issues. In January 2011 this committee submitted his report to RBI.

15. **Which Nationalist Democratic Progressive Party (NDPP) leader was sworn in as the fifth Chief Minister of Nagaland in March 2023?**

- (a) Wanweiroy Kharlukhi
- (b) Chingwang Konyak
- (c) Tokheho Yephthomi
- (d) Neiphiu Rio

Ans. (d) : In March 2023, Nationalist Democratic Progressive Party (NDPP) leader Neiphiu Rio was sworn as the Fifth chief minister of the Nagland. Before this he held the post of chief minister for three consecutive terms from 2003-08, 2008-13, 2013-14.

16. **Which of the following states has launched the 'Mo Ghara' or 'My Home' Scheme, with an aim to transform kutcha houses into Pucca Ones ?**

- (a) West Bengal
- (b) Jharkhand
- (c) Chhattisgarh
- (d) Odisha

Ans. (d) : Odisha Government has started 'Mo Ghara' or "Mera Ghar" scheme with the aim of converting mud houses into solid houses. This scheme provide credit linked financial assistance to economically and socially weaker families. This scheme is completely state funded.

17. **In the 1830's, which Scottish man was Commissioned by the East India Company to prepare reports on Education and progress in the native schools of Bengal and Bihar?**

- (a) Anthony Mc Donnel
- (b) John Sargent
- (c) William Adam
- (d) Joseph Hartog

Ans. (c) : William Adam was a Scottish missionary. He was given the task of reporting to the company on the progress of education in the Bihar and Bengal district school in 1830. Adam found that there were more than 1 Lakh schools in Bengal and Bihar. These Institution were small with the number of student in each around 20.



18. In the context of a Microsoft Excel sheet, what does the term 'workbook' mean?
- A single sheet within a file
 - The entire Microsoft Excel file
 - A formula used in calculations
 - A chart or graph

Ans. (b) : In the context of Microsoft Excel sheet workbook means the entire Excel file of Microsoft. A workbook is a file that contains one or more worksheets used to organize data.

19. When was the First Five-Year Plan of India launched?
- 1950
 - 1951
 - 1956
 - 1961

Ans. (b) : The first Five year plan was started in 1951 by prime Minister Jawaharlal Nehru. This plan was based on the Harrod-Domar Model. The plan focused on agricultural Price stability, Power and transportation.

20. On cold pressing groundnut, oils are released. This indicates the presence of
- Carbohydrates
 - Fats
 - Vitamins
 - Proteins

Ans. (b) : When Peanuts are pressed oil comes out, it show the presence of fat. Peanuts considered a cheap source of protein. It contains fiber, fat magnesium, phosphorus, carbohydrates. Potassium and calcium.

21. The Pala rulers achieved their domination in which province of India ?
- Orissa
 - Kashmir
 - Bengal
 - Assam

Ans. (c) : Pala Ruler established their dominance in Bengal. The Pala empire was established by Gopal in 750 AD. The Pala rulers were followers of the Mahayan Branch of Buddhism. The Palas made significant contributions to art and literature specially in the fields of sculpture, painting and poetry king Dharmapala was a significant ruler who established Vikramshila university.

22. The Arid Soil are developed in the western part of which state from the following ?
- Bihar
 - Assam
 - Rajasthan
 - Telangana

Ans. (c) : Arid Soil has developed in the western part of the Rajasthan. The western part of Rajasthan is desert because the temperatures are very high in summer and the location of the Aravali Mountain range lie parallel to the path of the Arabian branch of the south-west monsoon. Due to this reasons no rain occur in this part.

23. Which of the following is not included while estimating National Income ?

- Goods sold by street hawkers
 - Services of housewives
 - Production of vegetable in kitchen garden.
- All I, II and III
 - Only II and III
 - Only I and II
 - Only III

Ans. (a) : While estimating National Income goods sold by street hawkers, services of house-wives and vegetable production in kitchen garden are not included. The value of goods and services produced by a country in a financial year is known as national income. For measurement of national income there are value added method, income method and expenditure method.

24. The process by which molecules from a region of higher concentration move to a region of lower concentration is known as:
- evaporation
 - boiling
 - diffusion
 - melting

Ans. (c) : The process by which molecules move from an area of higher concentration to lower concentration is called diffusion. In the process of diffusion the molecule of the one substance mix with the molecule of the other substance.

25. According to Census 2011 of India, which of the following groups of union territories has the highest urban population?
- Chandigarh and Lakshadweep
 - Daman & Diu and Lakshadweep
 - Puducherry and Lakshadweep
 - Puducherry and Chandigarh

Ans. (d) : According to census 2011, union territories of Puducherry and Chandigarh have the highest urban population.

Union Territory	Urban Population
Lakshadweep	50332
Andman Nicobar	143488
Puducherry	852753
Chandigarh	1026459

Note- The commission has considered option (a) of this question as correct.

26. After realising the deadly effects of depleting the ozone layer, under which programme was the decision taken to ban the usage of CFC?
- United Nations Development Programme
 - Natural State Environmental Programme
 - United Nations Environment Programme
 - Federal Energy Management Programme



Ans. (c) : Understanding the harmful effects of ozone layer depletion, CFC are being banned under the United Nations Environment Programme. The United Nations Environment Programme (UNEP) is the leading environmental authority in the United Nations system. UNEP uses its expertise to strengthen environmental standards and practices while helping implement environmental obligations at the country, regional and global levels.

27. A low pitched but louder sound has

- (a) Lower frequency and higher amplitude.
- (b) higher frequency and lower amplitude.
- (c) lower frequency and lower amplitude.
- (d) higher frequency and higher amplitude.

Ans. (a) : A low pitched but louder sound has low frequency and high amplitude. Pitch is the quality of sound that is controlled by the rate of vibrations that produce it.

28. When two nuclei fuse together forming one nucleus during cell fusion, it is known as:

- (a) Synkaryon
- (b) Eukaryon
- (c) Heterokaryon
- (d) Syncytium

Ans. (a) : When two nuclei join together to form one nucleus during cell fusion it is called synkaryon. Zygote nucleus. Cell fusion is an important cellular process in which several uninucleated cells join together to form a multiunit cell which is known as syncytium.

29. In 2023, who among the following individuals served as the governor of Telangana?

- (a) Tamilisai Soundararajan
- (b) Baby Rani Maurya
- (c) Kalraj Mishra
- (d) Ganesh Lal

Ans. (a) : Tamilisai Soundararajan joined the charge of the governor of Telangana in 2023. According to the article 155 of the Indian constitution the governor is appointed by the president for five years. According to article 156 the governor holds office by the pleasure of the president.

30. What does the CONCATENATE function do in Microsoft Excel ?

- (a) Combines text from multiple cells into one cell.
- (b) Splits text into separate cells.
- (c) Converts text to uppercase
- (d) Finds the average of a range of cells

Ans. (a) : The CONCATENATE function in Excel allows to combine or concatenate multiple strings or cell values into one cell. The CONCATENATE function is categorized under Excel Text Functions.

31. Which of the following sports events was NEVER hosted by India?

- (a) ICC Men World Cup Cricket
- (b) Commonwealth Games
- (c) Olympics
- (d) Asian Games

Ans. (c) : Olympic Games have never been organized by India. The Commonwealth Games were organized by India in New Delhi. The Asian Games were organized by India in 1951 and 1982. The men's cricket world cup was jointly hosted by India in 1987, 1996 and 2011, 2023.

32. Kala Ramnath is associated with which of the following gharanas?

- (a) Indore gharana
- (b) Mewati gharana
- (c) Bhendi Bazaar gharana
- (d) Agra gharana

Ans. (b) : Kala Ramnath belongs to Mewati Gharana. Kala Ramnath is a skilled violinist. She trained under the Pandit Jasraj. In 2016 she was honored with the Sangeet Natak Akademi award.

33. What is the name of the compound with the formula N_2O_5 ?

- (a) Dinitrogen pentoxide
- (b) Nitrous oxide
- (c) Nitrogen dioxide
- (d) Nitric oxide

Ans. (a) : The IUPAC name of the compound N_2O_5 is Di-nitrogen pent oxide. It is used as a strong oxidizer in high fuel rockets. It is also used as a nitrating agent in modern synthetic organic chemistry.

34. Which one of the following has the largest population in a Food Chain ?

- (a) Primary Consumers
- (b) Secondary Consumers
- (c) Producer
- (d) Decomposers

Ans. (d) : Decomposers have the largest population in the food chain. Decomposers are organisms, often bacteria, fungus or invertebrates that feed on and break down dead plant or animal matter, making organic nutrients available to the ecosystem.

35. Who marked the historic moment by unveiling the 'Yashobhoomi' convention centre in Delhi in September 2023 ?

- (a) Arvind Kejriwal
- (b) Dharmendra Pradhan
- (c) Narendra Modi
- (d) Droupadi Murmu

Ans. (c) : In September, 2023 'Yashobhoomi' convention centre was inaugurated by Prime Minister Narendra Modi in Delhi.



36. On which date did the cantonment of Meerut break out in military mutiny during the 1857 movement?

- (a) 30 March 1857 (b) 10 May 1857
(c) 30 May 1857 (d) 09 April 1857

Ans. (b) : During the movement of 1857 there was a ministry mutiny in the cantonment of Meerut on May 10, 1857. In 1857 Meerut cantt had three native (Indian) and three British Regiments. On May 9, 85 soldiers were court-martialed for refusing to use greased cartridges. Due to this reason the soldiers revolted on 10 May, 1857.

37. In which year was the Integrated Child Development Scheme (ICDS) launched in India?

- (a) 1984 (b) 1982
(c) 1975 (d) 1978

Ans. (c) : Integrated Child Development Scheme (ICDS) was started in India in 1975. This scheme was started by the ministry of women and child development. This scheme provides nutritional meals, immunization, health check-up and referral services to children under 6 years of age and their mothers.

38. The Registration of Births and Deaths (Amendment) Bill was introduced in the Lok Sabha by which ministry on 26 July 2023?

- (a) Ministry of Home Affairs
(b) Ministry of Women and Child Development
(c) Ministry of Health and Family Welfare
(d) Ministry of Information and Broadcasting

Ans. (a) : The Birth and Deaths Registration (Amendment) Bill was introduced in Lok Sabha by the ministry of Home Affairs on 26 July, 2023. This bill includes provisions regarding creating a data base of births and deaths and issuing electronic certificates of birth and death.

39. What is the height of the Kanchenjunga peak?

- (a) 8859 m (b) 8958 m
(c) 8598 m (d) 8527 m

Ans. (c) : The height of Kanchenjunga is 8598 meters. This mountain range is located in the Eastern Himalaya on the border of Sikkim and Eastern Nepal. It is the third highest Mountain range in the world. Tamur river flows in its west and Teesta river flows in east.

Note- In some source the height of Kanchenjunga is 8586 meters.

40. India defeated West Indies in which of the following World Cup finals?

- (a) 1983 England (b) 2007 West Indies
(c) 2019 England (d) 2003 South Africa

Ans. (a) : The cricket world cup held in England in 1983 India won its first world cup by defeating West Indies. Kapil Dev was the captain of the Indian team in this world cup.

41. According to Census of India 2011, which state recorded negative population growth rate?

- (a) Manipur (b) Nagaland
(c) Sikkim (d) Kerala

Ans. (b) : According to census 2011, negative population growth was recorded in Nagaland. According to the 2001 census the total Population of Nagaland was 1988602 which was recorded at 1980602 in 2011 census. Thus negative population growth was recorded in Nagaland.

42. A Village is established in a region where land meets the Ocean. What is this region called ?

- (a) Marshy Land (b) Sea Beach
(c) Tropical Region (d) Coastal region

Ans. (d) : A village is established in an area where the land meets the sea is called coastal area. This area is directly affected by sea waves and tides.

43. In which of the following groups of the periodic table is the metallic element 'silver' found?

- (a) Group 15 (b) Group 11
(c) Group 3 (d) Group 7

Ans. (b) : The metallic element silver is found in group 11 of the periodic table. Group 11 elements are inert and corrosion resistant and are also known as coin metals because of their use in coin minting.

44. Which chemical compound is responsible for the spicy taste in chilli peppers?

- (a) Capsaicin (b) Caffeine
(c) Ethanol (d) Tannin

Ans. (a) : Pungency in Chilli is due to the presence of the capsaicin. Red pepper contains about 2.5 mg of capsaicin per gram. Red fruits and vegetables are colored by natural plant pigments called Lycopene.

45. The largest river system of Rajasthan is

- (a) Bhima (b) Tapi
(c) Kaveri (d) Luni

Ans. (d) : In the given option Luni is the largest river system of Rajasthan. In north-western India, the Luni is the largest river in the Thar desert. It originates in the Pushkar valley of the Aravalli Range near Ajmer. It ends in marshy lands of Rann of Kutch in Gujarat, Sukri, Bandi, Khari, Jawai are the tributary of the Luni.

46. Before starting a 5 day and 5 night excursion, Mr. Patel provided all his students with battery powered flash lights. He also gave them some extra batteries to use as spare. Then Mr. Patel asked them whether they know how the



batteries will produce electricity and help them. What do you think the correct answer to his question is ?

- (a) Electricity is produced by the chemicals stored in the battery.
- (b) Electricity is produced by friction between the battery and the flash light.
- (c) Electricity is saved in the battery from the factory that produce it.
- (d) Battery extracts electricity from the environment and passes it to the flash light.

Ans. (a) : Electricity is produced by the battery due to chemicals stored in the battery. A battery is a device that stores chemical energy and converts it into electrical energy. The chemical reaction in a battery involve the flow of electrons from one material to another, through an external circuit.

47. Which of the following is an example of formation of metamorphic rocks ?

- (a) Formation of Chalk
- (b) Formation of Limestone
- (c) Formation of Slate
- (d) Formation of Sandstone

Ans. (c) : Formation of slate is an example of the formation of metamorphic rocks. Slate is formed as a result of transformation of clay, shale and volcanic ash. Igneous and sedimentary rocks are transformed into metamorphic rocks due to extreme heat and pressure.

48. Which word has been substituted for the words 'Unity of the Nation' in the 42nd Amendment Act of the Preamble of the Constitution of India?

- (a) Unity and honesty of the nation
- (b) Unity and equity of the nation
- (c) Unity and integrity of the nation
- (d) Unity and morality of the nation

Ans. (c) : Unity and integrity of the nation have been substituted for the words 'Unity of the Nation' in the 42nd Amendment Act of the preamble of the constitution of India. In other word the preamble has been amended by the 42nd constitutional Amendment Act (1976), which added three new words-socialist, secular and integrity.

49. The animals or plants which can inbreed successfully must belong to the same _____.

- (a) Planet
- (b) Country
- (c) Species
- (d) Locality

Ans. (c) : Animals or plants that can inbreed successfully must belong to the same species. When reproduction occurs between genetically similar organisms it is called interbreeding.

50. Pascal is the SI unit of _____, which is defined as a force of 1 N applied uniformly over an area of 1 m².

- (a) mass density
- (b) power
- (c) pressure
- (d) energy

Ans. (c) : Pascal is the SI unit of the pressure. It is denoted by Pa. 1 Pascal is equal to 1 Newton per square meter of pressure.

$$1 \text{ Pa} = 1 \text{ N/m}^2 = 1 \text{ kg/m}^2$$

Section : General Engineering Electrical

1. An uneven air gap in the stator and the rotor of a squirrel cage induction motor will lead to _____ during operation.

- (a) increased current
- (b) increased speed
- (c) increased vibrations
- (d) increased torque

Ans. (c) : An uneven air gap in the stator and the rotor of a squirrel cage induction motor will lead to increased vibrations during operation.

Vibration issues tend to originate from any of the following causes-

1. Uneven air gap between rotor and stator.
2. Loose or broken rotor bar.
3. Poor quality of electric power: voltage unbalance, harmonics.
4. Excess load

2. A series R-L-C circuit having $R = 5 \Omega$, $L = 400 \text{ H}$ and $C = 4 \text{ F}$ is fed from a $400 \angle 0^\circ$ volt supply. Then the voltage across the capacitor at resonance will be _____.

- (a) 400 V
- (b) 1000 V
- (c) 800 V
- (d) 200 V

Ans. (c) : Given,

$$R = 5\Omega, \quad L = 400\text{H}, \quad C = 4\text{F}$$

$$V_s = 400 \angle 0^\circ \text{V}$$

At resonance, the net voltage across the source equals to the voltage across the resistor, i.e. $V_s = V_R = 400 \angle 0^\circ \text{V}$

$$\text{Quality factor (Q)} = \frac{1}{R} \sqrt{\frac{L}{C}} = \frac{1}{5} \sqrt{\frac{400}{4}}$$

$$Q = \frac{1}{5} \times 10 = 2$$

$$Q = \frac{V_L}{V_R} = \frac{V_C}{V_R}$$

$$2 = \frac{V_C}{400}$$

$$V_C = 800\text{V}$$



3. Which of the following effects is predominant when a dielectric material is polarised?

- (a) It makes charged particles free to move and causes current to flow in the material.
- (b) It causes current to flow in the material.
- (c) It makes charged particles free to move
- (d) Charged particles re-orientate themselves in the out phase with the electric field

Ans. (a) : When a dielectric material is polarised, it makes charge particles free to move and causes current to flow in the material.

When an electric field is applied to a dielectric substances, the dielectric material become polarized, such that the negative charges in the material orient themselves towards the positive electrode and the positive charges shift toward the negative electrode.

4. If the power factor of 500 KVA, 21 KW, 3-phase star connected alternator is increased from its initial value, then the efficiency of the synchronous generator will _____.

- (a) increase
- (b) remain constant
- (c) decrease
- (d) become zero

Ans. (a) : If the power factor of an alternator is increased from its initial value, then the efficiency of the synchronous generator will increase.

The power factor is a measure of how effectively apparent power is being converted into useful power as output.

5. What type of boilers are suitable for low-maintenance cost, small size and low-pressure plants?

- (a) Fire tube boilers
- (b) Supercritical boilers
- (c) Water tube boilers
- (d) High-pressure boilers

Ans. (a) : Fire tube boilers are suitable for low-maintenance cost, small size and low-pressure plants.

- When the flames and hot gases, produced by combustion of fuel, pass through the tubes which are surrounded by water, then the boilers are named as fire tube boilers.

- When water is contained inside the tubes (water tube) which are surrounded by flame and hot gases from outside named as water tube boilers.

6. In electrical installation and costing, which of the following is NOT a scope of national electrical code?

- (a) Distinguishing of fundamental components
- (b) Recommendations concerning safety
- (c) Standard good practices
- (d) General safety procedure

Ans. (a) : Distinguishing of fundamental components is NOT a scope of national electrical code.

The national electrical code (NEC) was created for the protection and safeguarding of industrial personnel and property from potential dangers associated with electrical installations.

7. Which of the following is/are true regarding the significance of the 'barrier' in the rotor of a synchronous reluctance motor?

- 1. It prevents the rotor from rotating at synchronous speed.
- 2. It helps to reduce eddy current losses in the rotor.
- 3. It increases the magnetic flux density in the rotor.
- 4. It improves the torque characteristics of the motor.

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

Ans. (b) : In the rotor of a synchronous reluctance motor, the barriers can be designed to-

- (i) Improve the torque and flux-weakening capability as well as the power factor.
- (ii) It helps to reduce eddy current losses in the rotor.
- (iii) It improves the torque characteristics of the motor.

8. The torque developed by a 3-phase induction motor least depends on which the following options ?

- (a) rotor current
- (b) rotor power factor
- (c) shaft diameter
- (d) rotor EMF

Ans. (c) : The torque developed by a 3-phase induction motor least depends on shaft diameter.

The torque (T) of a 3-phase induction motor is directly proportional to the product of stator flux per stator pole (ϕ), rotor current (I_2), and the power factor of the rotor ($\cos \theta_2$).

$$T \propto \phi I_2 \cos \theta_2$$

$$T = k \phi I_2 \cos \theta_2$$

Rotor emf is directly proportional to flux per stator pole i.e. $E_2 \propto \phi$

$$\therefore T \propto E_2 I_2 \cos \theta_2$$

$$T = k E_2 I_2 \cos \theta_2$$

9. Which of the following is a pure resistive device?

- (a) Generator
- (b) Heater
- (c) Transformer
- (d) Motor

Ans. (b) : Heater is a pure resistive device.

Nichrome wire is generally used as a heating element in heating appliances. It offers a very large resistance. So large amount of electric energy is converted into a large amount of heat energy.



10. A conductor of length 5 m moves at an angle 30° to the direction of the magnetic field of flux density 1.4 Wb/m^2 . If the velocity of the conductor is 40 m/s , then calculate the EMF induced in it.

- (a) 100 volts (b) 0 volt
(c) 1400 volts (d) 140 volts

Ans. (d) : The emf induced when the conductor moves at an angle θ to the direction of a uniform magnetic field is given by:

$$\text{EMF} = BLv \sin\theta$$

magnetic flux density (B) = 1.4 Wb/m^2

Length of conductor (L) = 5 m

Velocity of conductor (v) = 40 m/s

$$\theta = 30^\circ$$

$$\text{EMF} = BLv \sin\theta$$

$$= 1.4 \times 5 \times 40 \times \sin 30^\circ$$

$$= 1.4 \times 5 \times 40 \times \frac{1}{2}$$

$$\text{EMF} = 140 \text{ volts}$$

11. In electromagnetism, the work done on a unit n-pole in moving once around any complete path will be equal to the product of the current and the number of turns enclosed by that path is stated by _____.

- (a) Coulomb's law
(b) Laplace's law
(c) Lenz's law
(d) Work's law

Ans. (d) : In electromagnetism, the work done on a unit n-pole in moving once around any complete path will be equal to the product of the current and the number of turns enclosed by that path is stated by work's law.

$$\oint H dr = NI$$

Where, H is the magnetizing force at a distance r. Work law can be used to find magnetizing force (H) in simple conductor arrangements.

12. The wattmeter method is used to measure power in a three-phase load. The wattmeter readings are 200 W and -35 W. Find the respective values of active power and reactive power.

- (a) 235 W and $50\sqrt{3}$ VAR
(b) 165 W and $\frac{50}{\sqrt{3}}$ VAR
(c) 165 W and $235\sqrt{3}$ VAR
(d) 235 W and $\frac{150}{\sqrt{3}}$ VAR

Ans. (c) : Given,

The reading of first wattmeter (W_1) = 200 W

The reading of second wattmeter (W_2) = -35 W

$$\begin{aligned} \text{Total active power (P)} &= W_1 + W_2 \\ &= 200 + (-35) \\ &= 165 \text{ W} \end{aligned}$$

$$\begin{aligned} \text{Total reactive power (Q)} &= \sqrt{3}(W_1 - W_2) \\ &= \sqrt{3}[(200) - (-35)] \\ &= 235\sqrt{3} \text{ VAR} \end{aligned}$$

13. A capacitor of capacitive reactance 5Ω is connected across a 220 V, 50 Hz supply. Calculate the maximum current drawn by the capacitor.

- (a) 44 A (b) 100 A
(c) $44\sqrt{2}$ A (d) 40 A

Ans. (c) : Given,

Capacitive reactance (X_C) = 5Ω

Supply voltage (V_s) = 220 V

Frequency (f) = 50 Hz

$$I_{C(\max)} = \frac{V_{\max}}{X_C} = \frac{\sqrt{2} \cdot V_s}{X_C}$$

$$I_{C(\max)} = \frac{\sqrt{2} \times 220}{5} = 44\sqrt{2} \text{ A}$$

14. In an inductor, if the coil is wound on an insulating bobbin, without any magnetic material as core, then the inductor is called _____.

- (a) iron-cored inductor
(b) air-cored inductor
(c) ferrite-cored inductor
(d) variable inductor

Ans. (b) : In an inductor, if the coil is wound on an insulating bobbin, without any magnetic material as core, then the inductor is called air-cored inductor.

• Air core inductor, is an inductor without a magnetic core, but rather supported with only air inside of the coil. Coils are generally produced with copper material, insulated wire, stripped and non-stripped ends and tinned or bare ends.

15. A certain length of wire has its resistance measured as 20Ω at 20°C and 40Ω at 60°C . Calculate the temperature coefficient.

- (a) 30° (b) $\left(\frac{1}{40}\right)^\circ\text{C}$
(c) $\left(\frac{1}{60}\right)^\circ\text{C}$ (d) $\left(\frac{1}{30}\right)^\circ\text{C}$



Ans. (b) : Given,

Resistance at 20°C reference temperature $R_0 = 20\Omega$

Resistance at 60°C temperature $R_t = 40\Omega$

Change in temperature $(\Delta t) = 60^\circ - 20^\circ$
 $= 40^\circ\text{C}$

$$R_t = R_0(1 + \alpha\Delta t)$$

$$40 = 20(1 + \alpha 40) \quad (\alpha \text{ is temperature coefficient})$$

$$\frac{40}{20} = 1 + \alpha 40$$

$$2 - 1 = 40\alpha$$

$$\alpha = \left(\frac{1}{40}\right)^\circ\text{C}$$

16. In the context of magnetic circuits, the value of the leakage coefficient for electrical machines is usually about _____ .

- (a) 1.15 to 1.25 (b) 1.25 to 1.5
(c) 0.5 to 1 (d) 1.5 to 1.75

Ans. (a) : In the context of magnetic circuits, the value of the leakage coefficient for electrical machines is usually about 1.15 to 1.25.

• The ratio of the total flux (ϕ_a) produced to the useful flux (ϕ_g) set up in the air gap of the magnetic circuit is called leakage coefficient or leakage factor. It is denoted by λ .

$$\lambda = \frac{\phi_a}{\phi_g} \quad (\because \phi_a = \phi_g + \phi_l)$$

$\phi_l = \text{leakage flux}$

17. In electromagnetism, the magnetic field set up by a steady current density is described by _____ .

- (a) Ohm's law (b) Faraday's law
(c) Laplace's law (d) Lenz's law

Ans. (c) : In electromagnetism, the magnetic field set up by a steady current density is described by Laplace's law.

Biot savart law is also known as Laplace's law.

18. Which of the following is correct for a step down single-phase transformer?

- (a) Input volt ampere < output volt ampere
(b) Input volt ampere > output volt ampere
(c) Input volt ampere \neq output volt ampere
(d) Input volt ampere = output volt ampere

Ans. (d) : For step down or step up single-phase transformer the input volt ampere is equal to the output volt ampere.

• In step-down transformer, power remains constant but output (secondary) voltage is smaller than input (primary) voltage.

• In step-up transformer power remain constant but output (secondary) voltage is greater than input (primary) voltage.

19. The efficiency of a transmission line is _____ .

- (a) decreased with increase in load p.f.
(b) increased with increase in load p.f.
(c) independent of load p.f.
(d) increased with decrease in load p.f.

Ans. (b) : The efficiency of a transmission line is increased with increase in load power factor.

For single phase transmission line,

$$\text{Power (P)} = VI \cos\phi$$

$$P \propto \cos\phi \quad I \propto \frac{1}{\cos\phi}$$

Power factor depends on load current, with increase in load power factor, the load current is decreases hence the line losses are reduces i.e. transmission efficiency of a line increases.

20. In radial distribution system, the consumers are dependent on _____ and _____ .

- (a) multiple feeder, single distributor
(b) single feeder, multiple distributor
(c) single feeder, single distributor
(d) multiple feeder, multiple distributor

Ans. (c) : In radial distribution system, the consumers are dependent on single feeder and single distributor.

- Radial distribution system is used only when the substation is located at the centre of the consumers. In this system, different feeders regulates from a substation and feed the distributors at one end.
- In radial distribution system, the power flow is in only one direction.
- Voltage is affected much at for away load from the substation.

21. Ten capacitors, each of capacitance $20 \mu\text{F}$, are first connected in series and then in parallel. The ratio of the equivalent capacitance in series to the equivalent capacitance in parallel is:

- (a) 1/200 (b) 1/250
(c) 1/100 (d) 1/400

Ans. (c) : Given,

Capacitance of each capacitor (C) = $20\mu\text{F}$

No. of capacitor (n) = 10

When 'n' number of equal capacitor are connected in series and parallel then equivalent capacitance are respectively-

$$C_{\text{series}} = \frac{C}{n}, \quad C_{\text{parallel}} = nC$$

$$\frac{C_{\text{series}}}{C_{\text{parallel}}} = \frac{\frac{C}{n}}{nC} = \frac{1}{n^2} = \frac{1}{(10)^2} = \frac{1}{100}$$



22. At light load power factor of induction motors is _____.
 (a) 0.2 to 0.4 (b) 0.8 to 0.9
 (c) 0 (d) 1

Ans. (a) : At light load power factor of induction motors is 0.2 to 0.4.

- Because of air gap, the reluctance of the magnetic circuit of 3-phase induction motor is very high.
- Consequently, the current drawn by motor on no load is highly magnetizing current, the no-load current is lagging the applied voltage by large angle, for this reason power factor of induction motor at light load is low (0.2 to 0.4).

23. What is the primary purpose of a back-to-back power electronic converter (PEC) in type- C doubly-fed induction generator wind power plants?
 (a) To convert mechanical power to electrical power
 (b) To control reactive power production
 (c) To match stator and rotor frequencies
 (d) To regulate wind turbine speed

Ans. (c) : The primary purpose of a back-to-back power electronic converter (PEC) in type -C doubly-fed induction generator wind power plants is to match stator and rotor frequencies.

- The principle of the doubly-fed induction generator is that stator windings are connected to grid and rotor winding are connected to the converter via slip rings and back-to-back voltage source converter that controls both the rotor and the grid currents. Thus, rotor frequency can freely differ from the grid frequency.

24. The Variation in the effective width of a base in a Bipolar Junction Transistor is due to a variation in the applied _____.
 (a) base to collector voltage
 (b) collector current
 (c) emitter current
 (d) emitter to collector voltage

Ans. (a) : The variation in the effective width of a base in a bipolar junction transistor is due to a variation in the applied base to collector voltage this phenomenon is known as early effect.

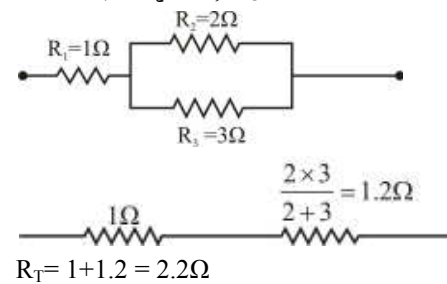
The early effect is the variation in the effective width of the base in a bipolar junction transistor (BJT) due to a variation in applied base to collector.

25. If $R_1 = 1 \Omega$, $R_2 = 2 \Omega$, $R_3 = 3 \Omega$, R_2 and R_3 are connected in parallel and the combination is in series with R_1 , then the total resistance will be _____.

- (a) 1.5Ω (b) 1.2Ω
 (c) 2.2Ω (d) 2.8Ω

Ans. (c) : Given,

$$R_1 = 1\Omega, R_2 = 2\Omega, R_3 = 3\Omega$$



26. With respect to AC fundamentals of an electrical signal, the ratio of the area under the curve to the base is called _____.
 (a) average value (b) peak value
 (c) RMS value (d) effective value

Ans. (a) : With respect to AC fundamentals of an electrical signal, the ratio of the area under the curve to the base is called average value.

$$\text{RMS value, } I_{\text{rms}} = \frac{I_m}{\sqrt{2}}, \text{ Average value, } I_{\text{avg}} = \frac{2I_m}{\pi}$$

$$\text{Form factor} = \frac{\text{RMS value}}{\text{Average value}}$$

27. 1 ampere of current is equal to how many number of electrons?
 (a) 4.25×10^{18} (b) 6.25×10^{18}
 (c) 4.25×10^{-18} (d) 6.25×10^{-18}

Ans. (b) : 1 Ampere of current is equal to 6.25×10^{18} number of electrons.

$$\text{Charge of electron (e)} = 1.6 \times 10^{-19}$$

$$\text{Current (i)} = 1 \text{ A}$$

$$I = ne \quad (\because n \text{ is number of electrons})$$

$$1 = n \times 1.6 \times 10^{-19}$$

$$n = \frac{1}{1.6 \times 10^{-19}} = 6.25 \times 10^{18}$$

28. An external resistance is added in the motor circuit during starting condition. The main purpose of this is to _____.
 (a) reduce the main flux
 (b) increase the main flux
 (c) reduce the starting current
 (d) increase the starting current

Ans. (c) : An external resistance is added in the motor circuit during starting condition. The main purpose of this is to reduce the starting current. At starting, the value of back-emf of DC motor is zero due to this very high armature current flow, so the purpose of including an external resistance at the time of starting a DC motor is to reduce the starting current.



29. Slip is 1 when rotor is _____ .

- (a) rotating at a speed higher than synchronous speed
- (b) rotating with synchronous speed
- (c) rotating at a speed lower than synchronous speed
- (d) stationary

Ans. (d) : Slip is 1 when rotor is stationary.

$$\text{Slip (s)} = \frac{N_s - N_r}{N_s}$$

$$\text{For slip (s)} = 1$$

$$1 = \frac{N_s - N_r}{N_s}$$

$$1 = 1 - \frac{N_r}{N_s}$$

$$N_r = 0$$

30. A 400 V, 3-phase synchronous motor has armature current of 150 A. It has synchronous resistance and reactance of 0.4 Ω and 4 Ω per phase, respectively. If the power developed is 130 kW and the iron and friction losses are 1 kW, then the efficiency of the motor will be _____.

- (a) 91.6%
- (b) 81.6%
- (c) 75%
- (d) 60%

Ans. (b) : Given,

$$\text{Armature current (I}_a\text{)} = 150\text{A}$$

$$\text{Synchronous resistance (R)} = 0.4\Omega$$

$$\text{Synchronous reactance (X}_s\text{)} = 4\Omega$$

$$\text{Developed power } P_d = 130\text{kW}$$

$$\text{Iron and friction loss} = 1\text{kW}$$

$$\text{Copper loss } P_{cu} = 3I_a^2 R = 3 \times (150)^2 \times 0.4$$

$$= 27000\text{W}$$

$$P_{cu} = 27\text{kW}$$

$$\text{Output power } P_o = \text{Developed power} - \text{Iron loss and friction}$$

$$= 130 - 1$$

$$P_o = 129\text{ kW}$$

$$\eta = \frac{P_o}{P_o + P_{cu}} = \frac{129}{129 + 27} = \frac{129}{156}$$

$$\eta = 81.6\%$$

31. A signal applied to a CRO has a rising time of 0.5 μs. Its bandwidth is:

- (a) 0.05 MHz
- (b) 0.7 MHz
- (c) 0.07 MHz
- (d) 0.2 MHzs

Ans. (b) : Given,

$$\text{Rise time (t}_r\text{)} = 0.5\mu\text{ sec}$$

$$t_r \times \text{B.W.} = 0.35$$

$$\text{Bandwidth (B.W.)} = \frac{0.35}{0.5\mu\text{sec}}$$

$$\text{B.W.} = 0.7\text{MHz}$$

32. What is Cold Reserve Capacity in a power system?

- (a) The power generating capacity that is not currently in use but can be brought online when needed.
- (b) The power generating capacity that is permanently shut down.
- (c) The power generating capacity that is readily available and online, ready to be dispatched.
- (d) The power generating capacity that is unavailable due to maintenance or other reasons.

Ans. (a) : Cold reserve capacity in a power system is the power generating capacity that is not currently in use but can be brought online when needed.

Firm reserve- It is the reserve capacity which must be available ever under emergency situation.

Spinning reserve- Reserve generating capacity that is connected to bus and ready to take the load.

Hot reserve- It is the reserved capacity available and ready to use. This capacity is in operation but not in services.

33. The hysteresis torque during the working of hysteresis motor depends on which factor?

- (a) Stator flux only
- (b) Stator flux, rotor flux and sine of hysteresis angle
- (c) Rotor flux only
- (d) Stator and rotor flux only

Ans. (b) : The hysteresis torque during the working of hysteresis motor depends on stator flux, rotor flux and sine of hysteresis angle.

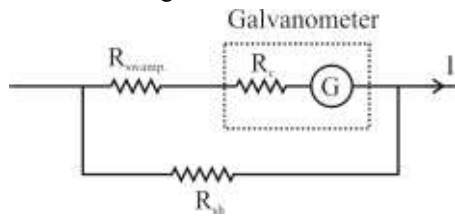
In the hysteresis motor, hysteresis torque remains practically constant.

34. Which of the following statements are correct about the errors in PMMC instruments?

- I. The swamping resistance is included in series with the moving coil to reduce errors.
 - II. The swamping resistance is included in parallel with the moving coil to reduce errors.
 - III. Errors are caused by weakening of the permanent magnet due to aging.
 - IV. Errors are caused by weakening of the spring due to aging and temperature.
- (a) Only I and III
 - (b) Only II, III and IV
 - (c) Only III and IV
 - (d) Only I, III and IV



Ans. (d) : In a PMMC instrument, swamping resistance is employed to compensate the error due to temperature variations. The swamping resistance is included in series with the moving coil to reduce errors.



- Errors are caused by weakening of the permanent magnet due to aging.
- Errors are caused by weakening of the spring due to aging and temperature.

35. In resistors, if the temperature is increased, then the resistance of alloys will _____.
 (a) remain the same (b) decrease
 (c) become zero (d) increase

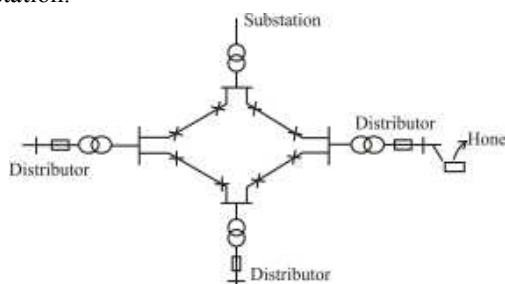
Ans. (d) : In resistors, if the temperature is increased then the resistance of alloy will increase.

- Resistance is directly proportional to temperature which means whenever temperature increases, the resistance of resistor will also tend to increase.

$$R_T = R_0(1 + \alpha \Delta T)$$

36. In ring distribution scheme, _____ of a _____ transformer form a loop.
 (a) secondaries, power
 (b) secondaries, distribution
 (c) primaries, distribution
 (d) primaries, power

Ans. (c) : In ring distribution scheme primaries of a distribution transformer form a loop. The loop circuit starts from the substation bus bars, makes a loop through the area to be served, and return to the substation.



In this system, each distribution transformer is fed with two feeders but on different paths.

The system is very reliable.

37. Which of the following statements is NOT true about DC signal?
 (a) Cell, batteries and regulated power supplies provide a steady DC that is ideal for an electronic circuit.

- (b) A DC voltage has both positive and negative values with change in time.
 (c) Pure Direct Current always has a constant value.
 (d) A DC voltage is always negative or always positive.

Ans. (b) : A direct current is a type of current that flow or moves only in one direction. Electrons moves from a negative direction towards a positive direction.

- As the direction flow remains the same, it provides constant voltage.
- It has constant polarity.
- At each instant of time, pure DC has constant magnitude.

38. Consider the following statements about equivalent circuit with core losses of single-phase motor and select the correct option.

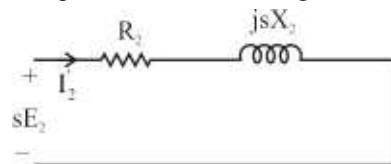
1. Slip at maximum torque is calculated with the help of maximum power transfer theorem.

2. Torque of an induction motor $T = \frac{\omega}{P}$, where

ω = speed in rad/sec, P = Power.

- (a) Both 1 and 2 are not true
 (b) Only 1 is true
 (c) Only 2 is true
 (d) Both 1 and 2 are true

Ans. (b) : Per phase circuit at running condition



$$P = T_{\text{fl}} \cdot \omega = s E_2 \frac{s E_2}{\sqrt{R_2^2 + (s X_2)^2}} \cdot \frac{R_2}{\sqrt{R_2^2 + (s X_2)^2}}$$

$$T_{\text{fl}} \cdot \omega = \frac{s^2 E_2^2 R_2}{R_2^2 + (s X_2)^2}$$

$$T_{\text{fl}} = \frac{1}{\omega} \cdot \frac{s E_2^2 R_2}{R_2^2 + (s X_2)^2}$$

Condition for maximum running torque-

$$\frac{dT_{\text{fl}}}{dR_2} = 0$$

$$R_2 = s X_2$$

- Slip at maximum torque $s = \frac{R_2}{X_2}$

- $T = \frac{P}{\omega}$



39. The magnetic flux through a coil having a single turn is varying according to the relation $\phi = (5t^2 + 4t + 10)$ Wb. Determine the impedance of the coil if the induced current through the coil is 5A at $t = 2$ seconds.

- (a) 4Ω (b) 8.4Ω
(c) 4.8Ω (d) 40Ω

Ans. (c) : Given,

Magnetic flux (ϕ) = $(5t^2 + 4t + 10)$ wb

Current (I) = 5A

Time (t) = 2 seconds.

$$\text{Induced EMF (E)} = \frac{d\phi}{dt}$$

$$E = \frac{d}{dt}(5t^2 + 4t + 10)$$

$$E = 10t + 4$$

at $t = 2$ sec

$$E = 10 \times 2 + 4 = 24V$$

$$E = I \cdot Z$$

$$\text{Impedance (Z)} = \frac{E}{I} = \frac{24}{5}$$

$$Z = 4.8\Omega$$

40. In case of commercial installations, it is advisable to use light sources rendering high colour for installations so as to retain customer attention. This light should be as bright as its surroundings in the range of _____.

- (a) 5 times (b) 10 times
(c) 20 times (d) 2 times

Ans. (a) : In case of commercial installations, it is advisable to use light sources rendering high colour for installations so as to retain customer attention. This light should be as bright as its surroundings in the range of 5 times.

41. In a transistor of common base connection, the ratio of change in the output current to change in the input current at a constant collector-base voltage is called _____.

- (a) input resistance factor
(b) current amplification factor
(c) base current amplification factor
(d) output resistance factor

Ans. (b) : In a transistor of common base connection, the ratio of change in the output current to change in the input current at a constant collector-base voltage is called current amplification factor (α).

$$\alpha = \frac{\Delta I_C}{\Delta I_E}$$

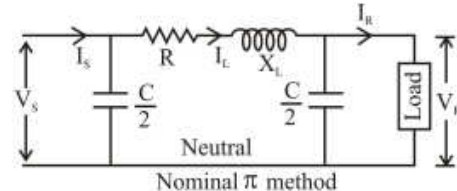
$$\alpha < 1$$

42. In nominal pi method, the line to neutral capacitance is:

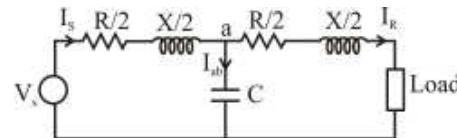
- (a) assumed lumped at the receiving end
(b) assumed lumped at the midpoint
(c) divided into two halves
(d) assumed lumped at the sending end

Ans. (c) : In nominal pi method, the line to neutral capacitance is divided into two halves.

One half being lumped at the sending end and the other half at the receiving end.



• In case of nominal-T representation of medium length transmission lines, the shunt capacitance can be assumed to be lumped at the middle of the line and the series impedance is divided into two equal parts.



43. As per the general principles of estimating, whenever practicable, it is advantageous to execute the work only after _____.

- (a) tenders are invited
(b) payments of bills are made
(c) tenders are evaluated
(d) purchase orders are placed

Ans. (a) : As per the general principles of estimating whenever practicable, it is advantageous to execute the work only after tender are invited.

Tender- It is an invitation from the owner to the contractor to execute some work at specified cost in specified time.

44. The deflecting torque in an electrostatic instrument can be calibrated by _____.

- (a) adjusting the spring constant
(b) adjusting the potential difference between the plates
(c) adjusting the frequency
(d) adjusting the damping

Ans. (b) : The deflecting torque in an electrostatic instrument can be calibrated by adjusting the potential difference between the plates.

• When the voltage to be measured is applied across the plates, the electric force between the plates gives rise to a deflecting torque, under this action, the movable plate moves and causes the deflection of the pointer to indicate the voltage being measured.



45. With the increase in voltage level of the distribution network, the weight and corresponding cost of the conductor material will be _____ and _____, respectively, for the same voltage drop.

(a) increased; decreased
(b) decreased; decreased
(c) increased; increased
(d) decreased; increased

Ans. (b) : With the increase in voltage level of the distribution network, the weight and corresponding cost of the conductor material will be decreased and decreased respectively, for the same voltage drop.

$$\text{Volume} \propto \frac{1}{(V \cos \phi)^2}$$

Increase in voltage level, thinner conductor is required. It reduces the weight and cost of the conductor material.

46. In an unbiased pnp transistor, the barrier voltages are _____ on the base and _____ on the emitter and collector.

(a) positive; positive (b) positive; negative
(c) negative; positive (d) negative; negative

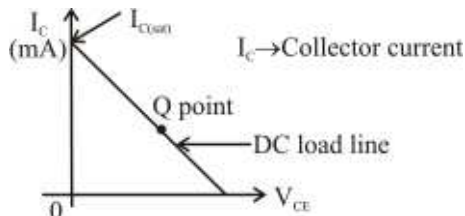
Ans. (b) : In an unbiased pnp transistor, the barrier voltage are positive on the base and negative on the emitter and collector.

- When no voltage is applied to a pnp transistor, it is said to be an unbiased pnp transistor.

47. Which of the following statements are true regarding the DC load line?

(a) It is a straight line drawn between I_C and V_{CE} .
(b) The quiescent point lies on the load line.
(c) In the DC load line, when the collector emitter voltage $V_{CE} = 0$, the collector current is maximum.
(a) All of a, b and c (b) Only a and c
(c) Only b and c (d) Only a and b

Ans. (a) : The DC load line is the load line of DC equivalent circuit, defined by reducing the reactive components to zero. It is used to determine the correct DC operating point, often called the Q point.



- DC load line is a straight line drawn between I_C and V_{CE} .
- Quiescent point (Q-point) lies on the load line.

- In the DC load line, when the collector emitter voltage $V_{CE} = 0$, the collector current is maximum.

48. I , R , X_L , V_R and $\cos \phi_R$ represent voltage regulation, line current, line resistance, line reactance, receiving end voltage and load power factor of transmission line, respectively. Also, receiving end voltage is more than the sending end voltage. Identify the correct expression for the leading load power factor.

(a) $IR \cos \phi_R \gg IX_L \cos \phi_R$
(b) $IR \cos \phi_R = IX_L \cos \phi_R$
(c) $IR \cos \phi_R < IX_L \cos \phi_R$
(d) $IR \cos \phi_R > IX_L \cos \phi_R$

Ans. (c) : The receiving end voltage is more than the sending end voltage is called as "Ferranti effect".

Sending end voltage (V_S) < Receiving end voltage (V_R)

$$IR \cos \phi_R < I X_L \cos \phi_R$$

- Ferranti effect in transmission lines is due to the presence of line capacitance.
- This type of effect mainly occurs because of light load or open circuit at the receiving end.
- Ferranti effect can be controlled by placing the shunt reactors at the receiving end of the lines.

$$X_{sh} = \frac{B}{1-A}$$

49. If the station has a thermal efficiency of 30% and electrical efficiency of 95%, find the overall efficiency of the station.

(a) 28.5% (b) 26.5%
(c) 29.5% (d) 27.5%

Ans. (a) : Given,

$$\text{Thermal efficiency } (\eta_{th}) = 30\% = 0.30$$

$$\text{Electrical efficiency } (\eta_{electrical}) = 95\% = 0.95$$

$$\text{Overall efficiency of the station } (\eta) = \eta_{th} \times \eta_{electrical}$$

$$\eta = 0.30 \times 0.95 \times 100$$

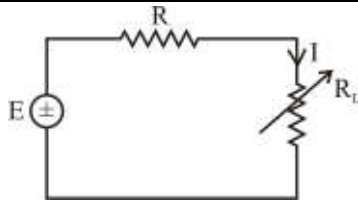
$$\eta = 28.5\%$$

50. A DC source of EMF E volts and internal resistance R ohms is connected to a variable load and it is adjusted such that the load absorbs maximum power from the source. The maximum power delivered from the source to the load is:

(a) $\frac{E^2}{4R}$ (b) $\frac{2E^2}{R}$
(c) $\frac{E^2}{R}$ (d) $\frac{E^2}{2R}$

Ans. (a) : A DC source of EMF E volts and internal resistance R is connected to a variable load and it is adjusted such that the load absorb maximum power from the source. The maximum power delivered from the source to the load is $\frac{E^2}{4R}$.





Power dissipated across the load resistance

$$P_L = I^2 R_L$$

$$I = \frac{E}{R + R_L}$$

$$R_L = \left(\frac{E}{R + R_L} \right)^2 \times R_L$$

For maximum power transfer from source to load-

$$\frac{dP_L}{dR_L} = 0$$

$$\frac{dP_L}{dR_L} = \frac{E^2 (R - R_L)}{(R + R_L)^2} = 0$$

$$R - R_L = 0$$

$$R_L = R$$

$$\text{So, } P_{\max} = \frac{E^2}{(R + R)^2} \times R = \frac{E^2}{4R}$$

51. The Fermi level position _____ in the energy band diagram of a p-n junction at equilibrium states.

- (a) is constant for electrons to cross the junction
- (b) is downhill for electrons to cross the junction
- (c) is uphill for electrons to cross the junction
- (d) does not exist

Ans. (a) : The Fermi level position is constant for electrons to cross the junction in the energy band diagram of a p-n junction at equilibrium state.

• Fermi level is located just below the conduction band and above the valence band top for n-type and p-type semiconductor material respectively.

52. The sum of instantaneous powers in the three phases in a three-phase system:

- (a) remains constant
- (b) twice the line frequency
- (c) is zero
- (d) thrice the line frequency

Ans. (a) : The sum of instantaneous powers in the three phase in a three-phase system remains constant and equal to 3 times of power per phase in balanced system.

$$P = 3 V_P I_P \cos \phi$$

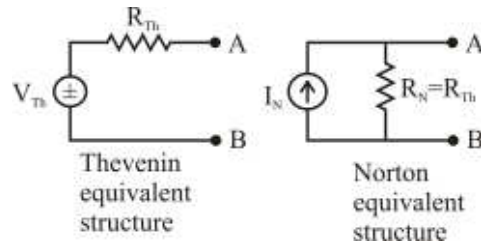
$$P = \sqrt{3} V_L I_L \cos \phi$$

53. A Thevenin equivalent source comprises of which of the following elements?

- (a) A single current source in parallel with a resistance
- (b) A single voltage source in series with a resistance
- (c) A single voltage source in parallel with a resistance
- (d) A single current source in series with a resistance

Ans. (b) : Thevenin equivalent source comprises a single voltage source in series with a resistance.

• Norton equivalent source comprises a single current source in parallel with a resistance.



54. A voltage source of $V(t) = (10t^3 - 5t + 10)$ Volt is applied across a 10F capacitor, the current through the capacitor at $t = 2$ sec is _____.

- (a) 1000 A
- (b) 1160 A
- (c) 1150 A
- (d) 1100 A

Ans. (c) : Given,

$$V(t) = (10t^3 - 5t + 10) \text{ volt}$$

$$\text{capacitor (C)} = 10\text{F}$$

$$\text{time}(t) = 2\text{sec}$$

$$\text{Current through capacitor (i)} = C \frac{dV}{dt}$$

$$i = 10 \frac{d}{dt} (10t^3 - 5t + 10)$$

$$i = 10(30t^2 - 5)$$

$$\text{At, } t = 2 \text{ sec.}$$

$$i = 10(30 \times 2^2 - 5)$$

$$i = 10 \times 115$$

$$i = 1150\text{A}$$

55. A light source with a candle worth of power produces _____.

- (a) one lumen / watt
- (b) one lumen / radian
- (c) one lumen / meter
- (d) one lumen / steradian

Ans. (d) : A light source with a candle worth of power produces one lumen/steradian.

• The candle power (CP) of a source is defined as the total luminous flux lines emitted by that source in a unit solid angle (ω)

$$CP = \frac{\text{Luminous flux(LF)}}{\text{Solid angle}(\omega)}$$



$$CP = \frac{LF}{\omega}$$

∴ Unit of luminous flux is lumen and unit of solid angle is steradian.

$$CP = \frac{\text{Lumen}}{\text{Steradian}}$$

56. In an induction motor if the rotor is locked, then the rotor frequency of the induction motor will be:

- less than supply frequency
- more than supply frequency
- zero
- equal to supply frequency

Ans. (d) : In an induction motor if the rotor is locked, then the rotor frequency of the induction motor will be equal to supply frequency.

When rotor is locked $N_r = 0$ and supply frequency is f .

$$\text{Slip}(s) = \frac{N_s - N_r}{N_s} = \frac{N_s - 0}{N_s}$$

$$s = 1$$

rotor frequency $f_r = s \cdot f$

$$f_r = 1 \times f = f$$

rotor frequency (f_r) = f

Therefore, the rotor frequency of the induction motor is equal to supply frequency.

57. For a D-MOSFET when biased at $V_{GS} = 0$ V having $I_{DSS} = 30$ mA and $V_{GS}(\text{off}) = -6$ V, the drain current is equal to _____.

- infinite
- 20 mA
- 0 mA
- 30 mA

Ans. (d) : Given,

$$V_{GS} = 0$$

$$I_{DSS} = 30 \text{ mA}$$

$$V_{GS(\text{off})} = V_P = -6 \text{ V}$$

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

$$I_D = 30 \times 10^{-3} \left(1 - \frac{0}{(-6)} \right)^2$$

$$= 30 \times 10^{-3} (1 - 0)^2$$

$$I_D = 30 \text{ mA}$$

58. Which of the following statements is FALSE in the context of the characteristics of synchronous motors?

- Synchronous motors have high power factor correction.
- They have low operating efficiency.
- They have constant speed operation.
- They are made in large sizes.

Ans. (b) : Synchronous motor have high operating efficiency.

Characteristics of the synchronous motor-

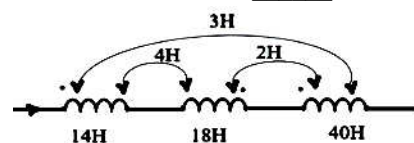
- Synchronous motors have high power factor correction.
- They have constant speed operation
- They are made in large size
- The speed of operation, in synchronism with the supply frequency
- Synchronous motors are inherently not self starting.

59. In the context of electronic components, if a number of resistances are connected and the reciprocal of the sum of individual resistances is equal to the sum of reciprocals of individual resistances, then the type of connection is called _____.

- parallel circuit
- grouping circuit
- series-parallel circuit
- series circuit

Ans. (a) : In the context of electronic components, if a number of resistances are connected and the reciprocal of the sum of individual resistances is equal to the sum of reciprocals of individual resistances, then the type of connection is called parallel circuit.

60. For the three coupled coils shown below, the total inductance will be _____.



- 66 H
- 60 H
- 81 H
- 90 H

Ans. (a) : Given,

$$L_1 = 14 \text{ H}, L_2 = 18 \text{ H}, L_3 = 40 \text{ H}$$

$$M_{12} = -4 \text{ H}, M_{23} = -2 \text{ H}, M_{31} = 3 \text{ H}$$

$$L_{eq} = L_1 + L_2 + L_3 + 2(M_{12} + M_{23} + M_{31})$$

$$= 14 + 18 + 40 + 2(-4 - 2 + 3)$$

$$= 72 + 2(-3)$$

$$= 72 - 6 = 66 \text{ H}$$

$$L_{eq} = 66 \text{ H}$$

61. Which of the following statements are correct?

- Lenz's law is based on the conservation of charge.
 - Lenz's law gives the direction of induced current.
 - Lenz's law is based on the conservation of energy.
- Both (a) and (c)
 - Both (b) and (c)
 - Both (a) and (b)
 - (a), (b) and (c)



Ans. (b) : According to Lenz's law, the direction of induced emf or current in a circuit is such as to oppose the cause that produces it.

- This law gives the direction of induced emf or induced current.
- Lenz's law is based on the conservation of energy.
- The magnitude of the induced emf is given by Faraday's laws of electromagnetic induction.

Hence, All above three statements are correct.

62. Mutual inductance between two magnetically coupled coils does NOT depend on which of the following?

- Temperature of the coil
- Cross sectional area of their common core
- Permeability of the core material
- Number of turns of the coils

Ans. (a) : Mutual inductance refers to the interaction of one coil's magnetic field with that of another coil.

$$\text{Mutual inductance (L)} = \frac{N^2 \mu A}{\ell}$$

Where, N- Number of turns,

μ -permeability of core material

A-Area of the wire,

ℓ -Average length

Hence, mutual inductance is depends on cross-sectional area, permeability and number of turns.

- Mutual inductance does not depend on temperature of the coil.

63. What is the correction factor of the wattmeter at a lagging power factor?

(Where, ϕ is the phase angle between the voltage applied to the pressure coil and the current in the current coil and β is the angle between the voltage applied to the pressure coil and the current in the pressure coil.)

- $\frac{\cos \phi}{\cos \beta \cos(\phi + \beta)}$
- $\frac{\cos \phi}{\cos \beta \sin(\phi - \beta)}$
- $\frac{\cos \phi}{\cos \beta \sin(\phi + \beta)}$
- $\frac{\cos \phi}{\cos \beta \cos(\phi - \beta)}$

Ans. (d) :

- Correction factor is a factor by which the actual wattmeter reading is multiplied to get the true power.

For lagging load,

$$\text{Correction factor} = \frac{\cos \phi}{\cos \beta \cos(\phi - \beta)}$$

- For leading load,

$$\text{Correction factor} = \frac{\cos \phi}{\cos \beta \cos(\phi + \beta)}$$

64. Which of the following systems is NOT a part of the operating mechanism in a single phase energy meter?

- Braking system
- Energy system
- Registering system
- Driving system

Ans. (b) : The energy meter is an electrical measuring device, which is used to record electrical energy consumed over a specified period of time.

The energy meter has four main parts-

- Driving system
- Moving system
- Braking system
- Registering system

- Energy system is not a part of the operating mechanism in a single phase energy meter.

65. Which of the following photometric quantities measures the total amount of visible light emitted by a source in all directions?

- Luminous flux
- Luminance
- Illuminance
- Luminous intensity

Ans. (a) : Luminous flux measure the total amount of visible light emitted by a source in all directions.

The S.I. unit of luminous flux is the lumen.

- Lumens = Candle power \times solid angle

$$\text{Lumen} = \text{CP} \times \omega$$

66. A three-phase star connected load draws 3600 VAR when the line voltage is 200 V and the line current is $10\sqrt{3}$ A. The power factor is ____.

- 1
- 0.6
- 0.8
- zero

Ans. (c) : Given,

$$\text{Line voltage (V}_L\text{)} = 200\text{V}$$

$$\text{Line current (I}_L\text{)} = 10\sqrt{3}\text{A}$$

$$\text{Reactive power (Q)} = 3600\text{VAR}$$

$$Q = \sqrt{3} V_L I_L \sin \phi$$

$$3600 = \sqrt{3} \times 200 \times 10\sqrt{3} \sin \phi$$

$$\sin \phi = \frac{3600}{\sqrt{3} \times 200 \times 10\sqrt{3}} = \frac{3600}{6000}$$

$$\sin \phi = 0.6$$

$$\text{Power factor (cos } \phi\text{)} = \sqrt{1 - \sin^2 \phi} = \sqrt{1 - (0.6)^2}$$

$$\cos \phi = 0.8$$

67. What is the correct order of the following operations, performed for conducting the estimation?

- Wiring layout
- Calculation of the total number of connections
- Selection of the main switch board



- (a) a, b, c (b) c, a, b
(c) b, c, a (d) a, c, b

Ans. (a) : Correct order of estimation-

- (i) Wiring layout- It is an essential aspect of electrical installation. It involves the placement and arrangement of electrical devices such as switches, outlets, and lighting fixtures in a building.
(ii) Calculation of the total number of connections.
(iii) Selection of the main switch board.

68. In the context of electromagnetism, according to Fleming's left-hand rule, the thumb indicates the _____.

- (a) length of the conductor
(b) direction of the magnetic field
(c) direction of the motion of the conductor
(d) direction of the current

Ans. (c) : In the context of electromagnetism, according to Fleming's left-hand rule, the thumb indicates the direction of the motion of the conductor.

- Fleming's left-hand rule is used for electric motors, while Fleming's right-hand rule is used for electric generators.

69. Which of the following statements are correct about DC welding machines-MG Set?

- (I) It uses non-coated type electrodes; hence the cost of electrode is cheap.
(II) It uses coated type electrodes; hence the electrode is expensive.
(III) It is best suited for welding thinner sheets (6 mm).
(IV) The initial cost of the machine is less compared to AC welding machine.

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

Ans. (d) : In DC welding machines-MG set, non-coated type electrodes are used, and non-coated electrodes are cheaper in cost.

- DC welding is best suited for the welding thinner sheet (6 mm).
- DC welding equipment is more expensive compared to AC welding.
- More complex process involved in controlling the arc.
- For a DC welding MG-set, differential compound DC generator is used.

70. Which crop is primarily used to produce biomass alcohol fuel or ethanol in India?

- (a) Rice (b) Corn
(c) Wheat (d) Sugarcane

Ans. (d) : Sugarcane crop is primarily used to produce biomass alcohol fuel or ethanol in India.

Ethanol production is an alternative route for de-watered microalgae biomass. This biomass can be sent to a thermo-chemical conversion process.

71. Which is the formula for transmission line efficiency?

(a) $\text{Efficiency} = \frac{\text{received power}}{\text{transmitted power}} \times 100$

(b) $\text{Efficiency} = \frac{-\text{received power}}{\text{transmitted power}} \times 100$

(c) $\text{Efficiency} = \text{received power} + \text{transmitted power} \times 100$

(d) $\text{Efficiency} = \text{received power} - \text{transmitted power} \times 100$

Ans. (a) : Efficiency of transmission line,

$$\eta = \frac{\text{Received power}}{\text{Transmitted power}} \times 100$$

- The efficiency of a transmission line is increased with increase in load power factor.

72. In a thermal power plant, the overall efficiency can be determined using which of the following?

- (a) Rankine Cycle Efficiency
(b) Carnot Cycle Efficiency
(c) Regenerative Cycle Efficiency
(d) Boiler Efficiency \times Generator Efficiency \times Turbine Efficiency

Ans. (d) : In thermal power plant.

Overall efficiency (η) =

$$\text{Boiler efficiency} \times \text{Generator efficiency} \times \text{Turbine efficiency}$$

73. Which of the following is a criterion used for selecting the ratio of the minimum fault current to the maximum load current in over-current protection of a transmission line?

- (a) To reduce the maximum load current on the transmission line
(b) To increase the possibility of maloperation under normal operating conditions
(c) To decrease the sensitivity of the protection system to faults
(d) To prevent the possibility of maloperation under normal operating conditions

Ans. (d) : Criterion used for selecting the ratio of the minimum fault current to the maximum load current in over-current protection of a transmission line to prevent the possibility of maloperation under normal operating conditions.



74. A 200-V, DC motor has an armature resistance of $0.5\ \Omega$. It is drawing an armature current of 20 A driving a certain load. Calculate the induced EMF in the motor under this condition.

- (a) 199.3 V (b) 203.7 V
(c) 190 V (d) 175.8 V

Ans. (c) : Given,

$$V = 200\text{V}$$

$$\text{Armature resistance } (R_a) = 0.5\Omega$$

$$\text{Armature current } (I_a) = 20\text{A}$$

Therefore induced emf in the dc motor is

$$V = E_b + (I_a \times R_a)$$

$$200 = E_b + 10$$

$$E_b = 200 - 10$$

$$E_b = 190\text{V}$$

75. A balanced, delta-connected load has an impedance of $3\angle 30^\circ\ \Omega/\text{phase}$. What will be the impedance of an equivalent star-connected load?

- (a) $4\angle 30^\circ\ \Omega/\text{phase}$
(b) $2\angle 60^\circ\ \Omega/\text{phase}$
(c) $1\angle 30^\circ\ \Omega/\text{phase}$
(d) $3\angle 90^\circ\ \Omega/\text{phase}$

Ans. (c) : If all the branch impedance of the delta-connected network are equal to Z , then each branch in its equivalent star network is equal to $Z/3$

Given,

$$Z_{\text{delta}} = 3\angle 30^\circ\ \Omega/\text{phase}$$

$$Z_{\text{star}} = \frac{Z_{\text{delta}}}{3}$$

$$Z_{\text{star}} = \frac{3\angle 30^\circ}{3}$$

$$= 1\angle 30^\circ\ \Omega/\text{phase}$$

76. Which of the following lamps is NOT a discharge lamp?

- (a) Incandescent lamp
(b) Neon lamp
(c) Mercury vapour Lamp
(d) Sodium vapour lamp

Ans. (a) : Incandescent lamp is not a discharge lamp. Incandescent lamp is a filament type lamp.

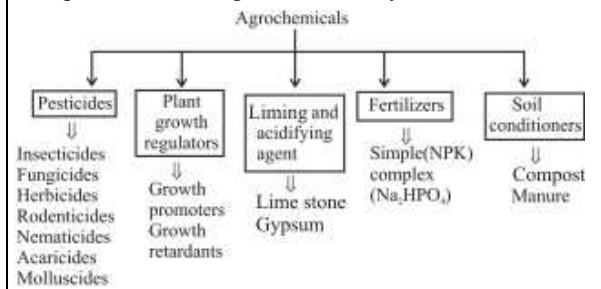
- Mercury vapour lamp, Neon lamp, sodium vapour lamp, etc are examples of discharge type lamps. Discharge lamp working at lagging power factor.

77. Which of the following is NOT broadly classified as a part of agrochemicals?

- (a) Insecticides (b) Digesicides
(c) Herbicides (d) Fungicides

Ans. (b) : Digesicides is not a part of agrochemicals.

- Agrochemicals are chemical products composed of fertilizers, plant-protection chemicals or pesticides, and plant-growth hormones used in agriculture. it is used for the operation of an agriculture ecosystem.



78. Which of the following statements is true about the voltage control of DC motors?

- (a) The application of this method is restricted to separately excited DC motors.
(b) The terminal voltage is kept constant and the field current is varied so as to obtain speed control.
(c) The application of this method is restricted to self-excited DC motors.
(d) The field current is kept constant and the terminal voltage is varied to obtain speed control.

Ans. (a) : Voltage control of DC motor is restricted to separately excited DC motors.

There are two methods of speed control of dc motor which are field control method and armature control method.

79. A 6-pole, 250 V wave connected shunt motor running at 955 rpm has 1200 armature conductors and useful flux/pole of 10m Wb. The armature and field resistance are $0.5\ \Omega$ and $250\ \Omega$, respectively. If the motor draws 20 A from the supply mains, then the value of torque developed by the motor is _____.

- (a) 65.8 N-m (b) 62.3 N-m
(c) 57.9 N-m (d) 45.6 N-m

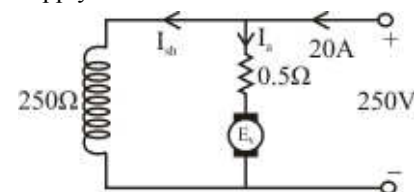
Ans. (d) : Given,

$$\text{Number of pole } (P) = 6, \text{ Speed } (N) = 955 \text{ rpm}$$

$$\text{terminal voltage } (V) = 250\text{V}, Z = 1200$$

$$\text{flux } (\phi) = 10\text{mWb}, R_a = 0.5\Omega, R_{sh} = 250\Omega$$

$$\text{Supply current } I = 20\text{A}$$



$$I_{sh} = \frac{250}{250} = 1A$$

$$I_a = 20 - 1 = 19A$$

$$E_b = V - I_a R_a \\ = 250 - 19 \times 0.5$$

$$E_b = 240.5V$$

$$P = \text{torque} \times \text{speed (rad/sec)}$$

$$\text{Torque} = \frac{P}{\omega} = \frac{E_b I_a}{\left(\frac{2\pi N}{60}\right)}$$

$$\text{Torque} = \frac{E_b I_a \times 60}{2\pi N}$$

$$\text{Torque} = \frac{240.5 \times 19 \times 60}{2\pi \times 955}$$

$$\text{Torque} = 45.6 \text{ Nm}$$

80. Eight capacitors of the same value are connected in series. Their equivalent capacitance is $200 \mu F$, the capacitance of each capacitor is _____.

- (a) $16 \mu F$ (b) $25 \mu F$
(c) $160 \mu F$ (d) $16 \times 10^{-4} F$

Ans. (d) : Given,

Number of capacitor of the same value (n) = 8

Series equivalent capacitance $C_{eq} = 200 \mu F$

Capacitance of each capacitor (C) = ?

$$C_{eq} = \frac{C}{n}$$

$$200 \mu F = \frac{C}{8}$$

$$C = 200 \times 8 \mu F = 1600 \mu F$$

$$C = 16 \times 10^{-4} F$$

81. What is the reactive power of a 3-phase, delta-connected system with line voltage of 100 V and line current of 40 A if the phase difference between the voltage and the current is 36.87° ?

- (a) 4.155 kVAR (b) 8.155 kVAR
(c) 6.155 kVAR (d) 2.155 kVAR

Ans. (a) : Given that,

$$V_L = 100V, I_L = 40A, \phi = 36.87^\circ, Q = ?$$

For delta connected system, $V_L = V_p, I_L =$

$$\text{So, } Q = \sqrt{3} V_L I_L \sin \phi = \sqrt{3} \times 100 \times 40 \times \sin 36.87^\circ \\ = \sqrt{3} \times 100 \times 40 \times 0.6 = 4.155 \text{ kVAR}$$

82. Which of the following statements correctly explains the relation between the maximum demand and the connected load during a practical scenario in a power system?

- (a) The maximum demand will always be less than the connected load.
(b) The maximum demand will always be greater than the connected load.
(c) The maximum demand and the connected load do not exhibit any relation with each other.
(d) The maximum demand will always be equal to the connected load.

Ans. (a) : The maximum demand will always be less than the connected load.

• Demand factor is the ratio of maximum demand on the power station to its connected load.

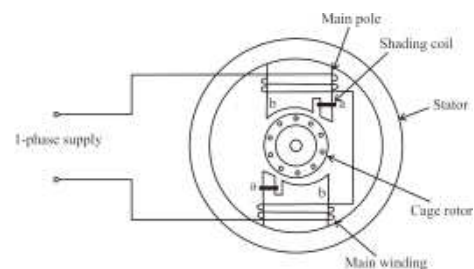
$$\text{Demand factor} = \frac{\text{Maximum demand}}{\text{Connected load}}$$

- The value of the demand factor is usually less than 1. It is because maximum demand is always less than the connected load.
• The knowledge of the demand factor is important in determining the capacity of the plant equipment.

83. In the shaded-pole induction motor, the shading coil fitted on the _____ is called _____.

- (a) auxiliary pole; non-shading pole
(b) main pole; non-shading pole
(c) auxiliary pole; shading pole
(d) main pole; shading pole

Ans. (d) : In the shaded-pole induction motor, the shading coil fitted on the main pole is called shading pole.



• Shaded-pole motors are best suited to the low-power application, because the motor has low starting torque and efficiency rating.

• Shaded-pole motors are built only in small size rating $\frac{1}{20}$ to $\frac{1}{6}$ HP

84. The plant capacity factor is related to _____.

- (a) plant reactance
(b) plant resistance
(c) plant impedance
(d) plant operating frequency

Ans. (d) : The plant capacity factor is related to plant operating frequency.

$$\text{Plant capacity factor} = \frac{\text{Average demand}}{\text{Plant capacity}}$$



- Plant capacity factor is the ratio of actual energy produced to the maximum possible energy that could be produced during a given period.

85. In an electrodynamic instrument, what happens to the torque when the current flowing through the coil is decreased?

- The torque remains constant.
- The torque increases.
- The torque becomes zero.
- The torque decreases.

Ans. (d) : In an electrodynamic instrument, the torque is decreases when the current flowing through the coil is decreases.

$$\text{For DC : } T_d \propto I^2$$

$$\text{For AC : } T_d \propto I_1 I_2 \cos \phi$$

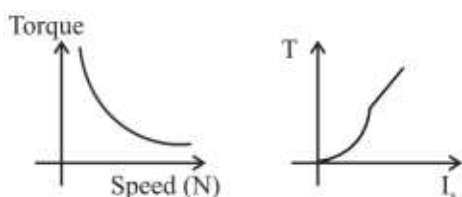
- Electrodynamometer type instrument are works on both AC and DC.

86. At steady-state characteristics of a DC series motor, which of the following statements are correct?

- The speed-torque relationship of a DC series motor is non-linear.
- Both the armature current and the field current of a DC series motor decrease with increasing load torque.
- The efficiency of a DC series motor is generally higher compared to DC shunt motor.
- The efficiency of a DC series motor is generally lower compared to DC shunt motor.

- Only statements I and IV are correct
- Statements I, II and III correct
- Only statements I and III are correct
- Statements I, II and IV are correct

Ans. (a) : The speed-torque relationship of DC series motor is non-linear.



- Torque of dc series motor

$$T \propto \phi \cdot I_a$$

Before saturation, $\phi \propto I_a$

$$T \propto I_a^2$$

- The efficiency of a DC series motor is generally lower compared to DC shunt motor.

87. How much energy in “kilowatt hours” is consumed in operating ten 100-watt bulbs for 20 hours per day in a month (30 days)?

- 600 kilowatt-hours
- 10000 kilowatt-hours
- 5000 kilowatt-hours
- 600000 kilowatt-hours

Ans. (a) : Given,

$$\text{Rating of bulb (P)} = 100\text{W}$$

$$\text{No. of bulb} = 10$$

$$\text{Time (t)} = 20 \times 30$$

$$= 600 \text{ hours}$$

$$\text{Energy} = P \times t$$

$$= \frac{10 \times 100 \times 600}{1000}$$

$$\text{Energy} = 600 \text{ kWh}$$

88. Which of the following are the properties of a good heating element?

- It should have low resistivity.
 - It should have high melting point.
 - It should have low temperature coefficient of resistance.
 - It should have high specific heat capacity.
- II, III and IV
 - I, II and III
 - Only II and III
 - I, II and IV

Ans. (c) : Properties of good heating elements are-

- High melting point
- Low temperature coefficient of resistance
- High resistivity
- Sufficient ductility to draw the metal or alloy in the form of wire.
- High oxidizing temperature

89. Calculate the reading that will be given by a hot-wire voltmeter when it is connected across the terminals of a generator whose voltage is given by $V(t) = (2 \sin \omega t + 3 \sin 3 \omega t + 5 \sin 5 \omega t)$ Volt.

- 10 volts
- 0 volts
- $\sqrt{38}$ volts
- $\sqrt{19}$ volts

Ans. (d) : $V(t) = (2 \sin \omega t + 3 \sin 3 \omega t + 5 \sin 5 \omega t)$ volt
Hot-wire voltmeter measures the rms value.

$$V_{\text{rms}} = \sqrt{\left(\frac{2}{\sqrt{2}}\right)^2 + \left(\frac{3}{\sqrt{2}}\right)^2 + \left(\frac{5}{\sqrt{2}}\right)^2}$$

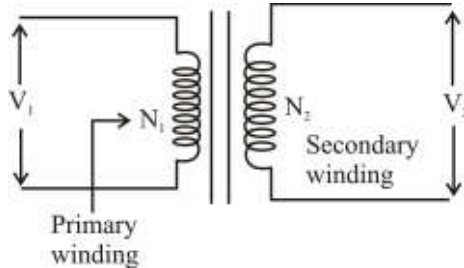
$$V_{\text{rms}} = \sqrt{19} \text{ volts}$$



90. Which of the following is correct with reference to step up single-phase transformer?

- (a) Turn ratio = Transformation ratio
- (b) Turn ratio < Transformation ratio
- (c) Turn ratio > Transformation ratio
- (d) Turn ratio \neq Transformation ratio

Ans. (a) : A step-up transformer is a transformer that has a primary voltage lower than the secondary voltage. Primary voltage, $(V_1) <$ Secondary voltage (V_2)



- Turn ratio = $\frac{\text{Number of turns of higher voltage winding}}{\text{Number of turns of lower voltage winding}}$

$$\text{Turn ratio } (n) = \frac{N_2}{N_1} \quad \dots(i)$$

- Transformation ratio, $k = \frac{\text{Number of turns of secondary winding}}{\text{Number of turns of primary winding}}$

$$K = \frac{N_2}{N_1} \quad \dots(ii)$$

From above equation (i) and (ii), we get-

For step up transformer

$$\boxed{\text{Turn ratio} = \text{Transformation ratio}}$$

- For step down transformer

$$\boxed{\text{Turn ratio} > \text{Transformation ratio}}$$

91. The ratio of the mean spherical candle power to the mean horizontal candle power is called _

- (a) lamp efficiency
- (b) beam factor
- (c) reduction factor
- (d) utilization factor

Ans. (c) : The ratio of the mean spherical candle power to the mean horizontal candle power is called reduction factor.

$$\boxed{\text{Reduction factor} = \frac{\text{MSCP}}{\text{MHCP}}}$$

Its value is always less than 1 and it will be around 0.8.

92. What happens to the reading of a wattmeter when the power factor of a circuit is changed from unity power factor to leading power factor?

- (a) The wattmeter reading increases
- (b) The wattmeter cannot measure the leading power factor
- (c) The wattmeter reading decreases
- (d) The wattmeter reading remains unchanged

Ans. (c) : The wattmeter reading decreases when power factor of circuit is changed from unity power factor to leading power factor.

- The wattmeter is an instrument for measuring the electric active power (average power).

The reading of wattmeter will be,

$$P_{\text{avg}} = V.I. \cos \phi$$

- At unity P.f., $\cos \phi = 1$

$$\text{then } P_{\text{avg}} = V.I$$

93. The current reverser in the earth tester converts _

- (a) AC to AC
- (b) DC to AC
- (c) DC to DC
- (d) AC to DC

Ans. (b) : The current reverser in the earth tester converts DC to AC.

- The earth tester uses a hand-driven generator. The rectifier and the rotational current reverser are the two principal components of the earth tester. The rectifier converts AC into DC. The earth tester works only on DC.

- Earth tester or earth resistance tester is used to find the resistance of earth.

- An earth tester is a special type of megger with some additional rotating current reverser and rectifier.

94. Total Reactive Power drawn from a three-phase balanced load where line voltage = V_L , Line current = I_L , Phase voltage = V_p and Phase current = I_p is given by:

- (a) $\sqrt{3}V_p I_p \sin \phi$
- (b) $\sqrt{3}V_L I_L \cos \phi$
- (c) $\sqrt{3}V_L I_L \sin \phi$
- (d) $\sqrt{3}V_p I_p \cos \phi$

Ans. (c) : Reactive power of 3- ϕ system is

$$Q_{3-\phi} = \sqrt{3}V_L I_L \sin \phi$$

$$\text{Active power } (P_{3-\phi}) = \sqrt{3}V_L I_L \cos \phi$$

$$\text{Apparent power } (S_{3-\phi}) = \sqrt{3}V_L I_L$$

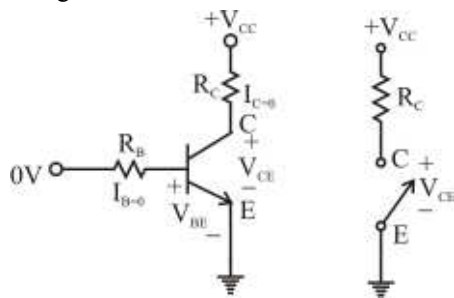
95. An ideal BJT acts as an open switch when:

- (a) $V_{CE} = 0$ and $I_c = 10 \text{ mA}$
- (b) $V_{CE} = V_{BC}$ and $I_c = 10 \text{ mA}$
- (c) $V_{CE} = V_{CC}$ and $I_c = 0$
- (d) $V_{BE} = V_{CC}$ and $I_B = 50 \mu \text{ A}$



Ans. (c) : An ideal BJT acts as an open switch when $V_{CE} = V_{CC}$ and $I_C = 0$

- A BJT acts like an open switch when it operates in the cut off region.



- A BJT act like closed switch, it needs to operate in the saturation region.

96. Which of the following statements is/are accurate regarding working principle of a reluctance start motor?

1. In reluctance, motor reluctance torque can occur once a ferromagnetic object is located within an exterior magnetic field, then the object can be line up through the external magnetic field.
2. The torque can be generated among the two fields which twirling the object in the region of the line through the magnetic field so the torque is used on the object to provide less reluctance for the magnetic flux.

- (a) Only 2 is true
- (b) Both 1 and 2 are true
- (c) Both 1 and 2 are not true
- (d) Only 1 is true

Ans. (b) : Both statements are true regarding working principle of a reluctance start motor.

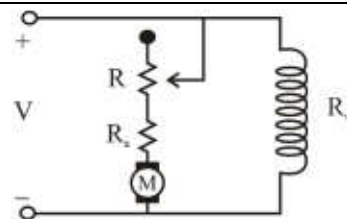
- In reluctance motor, reluctance torque can occur once a ferromagnetic object is located within an exterior magnetic field, then the object can be line up through the external magnetic field.

- The torque can be generated among the two fields which twirling the object in the region of the line through the magnetic field so the torque is used on the object to provide less reluctance for the magnetic flux.

97. What is the armature-circuit-resistance speed control method for DC motor?

- (a) Variation of armature terminal voltage
- (b) Variation of field flux
- (c) Variation of resistance in the armature circuit
- (d) Variation of resistance in the field circuit

Ans. (c) : Variation of resistance in the armature circuit is a method of speed control in DC motor.



- If we add resistance (R) in series with the armature, I_a decreases and hence, the speed also decreases.

$$N \propto \frac{E_b}{\phi}$$

$$N \propto \frac{V - I_a(R_a + R)}{\phi}$$

- Greater the resistance in series with armature, the larger decrements in speed.
- This method used only for below the base speed.

98. Cold reserve is the reserve capacity of the plant in _____ but NOT in _____ .

- (a) operation, operation
- (b) operation, service
- (c) service, operation
- (d) service, service

Ans. (c) : Cold reserve is the reserve capacity of the plant in service but NOT in operation.

- Hot reserve is the reserved generating capacity which is not in service but is in operation.

99. The maximum efficiency in the transmission of bulk AC power will be achieved when the power factor of the load is:

- (a) considerably less than unity
- (b) unity
- (c) slightly less than unity lagging
- (d) slightly less than unity leading

Ans. (d) : The maximum efficiency in the transmission of bulk AC power will be achieved when the power factor of the load is slightly less than unity leading.

- For maximum power transfer condition, load should be of leading nature.

100. In estimation and costing, the estimator must understand production cost, including labour and material cost of products, as well as discounts on purchases in order to:

- (a) gain knowledge
- (b) prepare schedules
- (c) work out profit
- (d) retain a list

Ans. (c) : In estimation and costing, the estimator must understand production cost, including labour and material cost of products, as well as discounts on purchases in order to work out profit.

