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

Date: 06.06.2024   **Timing: 1:00PM - 3:00 PM**

General Intelligence and Reasoning

1. The position (s) of how many letters will remain unchanged if each of the letter in the word **AMPLIFY** is arranged in the English alphabetical order?
(a) 1   (b) 2
(c) 3   (d) 4

Ans. (c) : On arranging the each letters of the given word 'AMPLIFY' in alphabetical order-
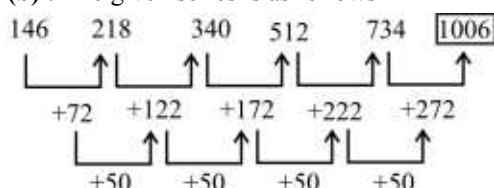
$$Ⓐ\ F\ I\ Ⓛ\ M\ P\ Ⓨ$$

Hence from the above it is clear that position of 3 letters (A, L, Y) will remain unchanged.

2. What should come in place of the question mark (?) in the given series?
146, 218, 340, 512, 734 ?
(a) 1128   (b) 1006
(c) 1146   (d) 1134

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

3. In a certain code language, 'let us eat' is written as ' de hj kn' and ' let us play' is written as 'de kn cx'. How is 'eat' written in the given language ?
(a) hj   (b) de
(c) cx   (d) kn

Ans. (a) : According to the question,

Hence, it is clear from above that eat will be written as 'hj'.

4. ADVN is related to GJPH in a certain way based on the English alphabetical order. In the same way, WHUB is related to CNOV. To which of the following is RFMJ related, following the same logic?
(a) WMFE   (b) XLGD
(c) WLFD   (d) XMGE

Ans. (b) : Just as,

5. In a certain code language, 'oh my god' is written as 'jk sr qw', and 'god is good' is written as 'dk zx sr'. How is 'god 'written in that language?
(a) dk   (b) sr
(c) qw   (d) jk

Ans. (b) : According to the question

Hence, 'god' is written as 'sr' in that language.

6. Select the pair in which the numbers are related to each other in the same way as are the numbers of the given pairs.
(NOTE : Operations should be performed on the whole numbers, without breaking down the numbers into its constituent digits. E.g. 13 - Operations on 13 such as adding/deleting /multiplying etc. Can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)
(376, 234)
(354, 212)
(a) (328, 283)   (b) (294, 145)
(c) (281, 139)   (d) (349, 217)

Ans. (c) : Just as,
$$376 – 234 = 142$$
and $354 – 212 = 142$
same as, from option (c)
$$281 – 139 = 142$$

7. In a certain code language,
'A + B' means 'A is the father of B'
'A – B' means 'A is the mother of B'
'A × B' means 'A is the wife of B', and
'A ÷ B' means 'A is the brother of B'.
How is P related to T if 'P ÷ Q – R × S + T'?
(a) Sister's husband
(b) Mother's brother
(c) Daughter's husband
(d) Mother's Mother's brother

Ans. (d) : According to the question, on the basis of given expression the blood relation diagram is as follows-
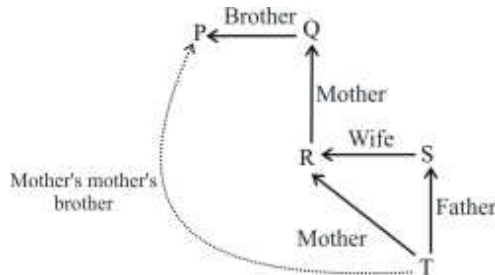
Hence, from the above it is clear that P is the Brother of Mother of T's Mother.

8. What will come in the place of the question mark (?) in the following equation, if '+' and '÷' are interchanged and '×' and '–' are interchanged?
24 + 6 – 11 × 15 ÷12 = ?
(a) 41   (b) 51
(c) 61   (d) 31

Ans. (a) : Given that,
$24 + 6 – 11 × 15 ÷ 12 = ?$
According to the question, on interchanging the signs,
$? = 24 ÷ 6 × 11 – 15 + 12$
$= 4 × 11 – 15 + 12$
$= 44 – 15 + 12$
$= 56 – 15$
$= 41$

9. What should come in place of the question mark (?) in the given series based on the English alphabetical order?
RDKW, WIPB, BNUG, GSZL, ?
(a) LKJU   (b) LXDE
(c) LXEQ   (d) LQSW

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

$R \xrightarrow{+5} W \xrightarrow{+5} B \xrightarrow{+5} G \xrightarrow{+5}$ L
$D \xrightarrow{+5} I \xrightarrow{+5} N \xrightarrow{+5} S \xrightarrow{+5}$ X
$K \xrightarrow{+5} P \xrightarrow{+5} U \xrightarrow{+5} Z \xrightarrow{+5}$ E
$W \xrightarrow{+5} B \xrightarrow{+5} G \xrightarrow{+5} L \xrightarrow{+5}$ Q

Hence $? = LXEQ$

10. What will come in place of the question mark (?) in the following equation if '÷' and '×' are interchanged?
104 × 8 ÷ 11 + 33 – 47 = ?
(a) 129   (b) 124
(c) 135   (d) 137

Ans. (a) : Given that,
$104 × 8 ÷ 11 + 33 – 47 = ?$
On interchanging the symbol as per the question,
$? = 104 ÷ 8 × 11 + 33 – 47$
$= 13 × 11 + 33 – 47$
$= 143 + 33 – 47$
$= 176 – 47$
$= 129$

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

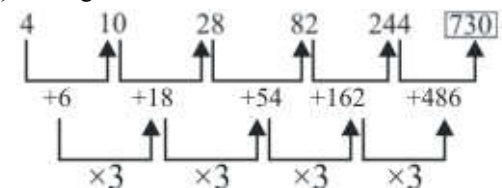**Ans. (c) :** On arranging each letters of the given word in English Alphabetical order,

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

12. What should come in place of the question mark (?) in the given series?
4, 10, 28, 82, 244, ?
(a) 698   (b) 680
(c) 730   (d) 714

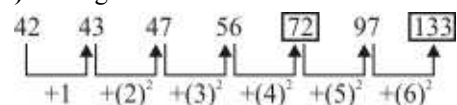**Ans. (c) :** The given number series is as follows-

Hence $? = 730$

13. What should come in place of the two question marks (?) in the given series in the same order?
42, 43, 47, 56, ? , 97, ?
(a) 71, 132   (b) 72, 133
(c) 70, 131   (d) 74, 135

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

Hence, option (b) will be the required answer.

14. Select the option in which the numbers share the same relationship as that shared by the given number triads.

39-36-33

67-64-61

(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. 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) 120-116-105   (b) 100-94-90

(c) 64-54-50   (d) 98-95-92

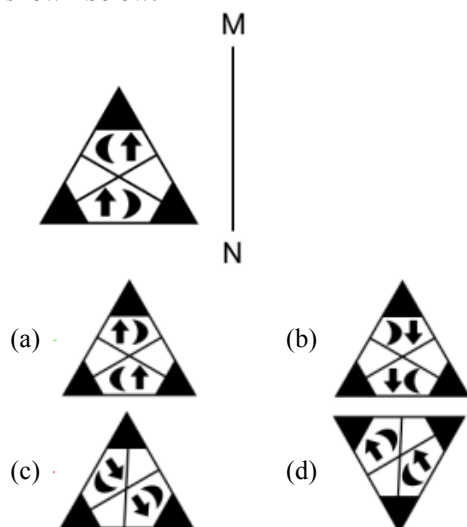**Ans. (d) :** Just as,

39 – 3 = 36

36 – 3 = 33

And

67 – 3 = 64

64 – 3 = 61

Same as, from option (d),

98 – 3 = 95

95 – 3 = 92

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

Ans. (a) : Mirror image of the given figure will be option figure (a).

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

ZBL, YDM, XFN, WHO, ?

(a) UJP   (b) VJP

(c) RKL   (d) RKN

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

$$Z \xrightarrow{-1} Y \xrightarrow{-1} X \xrightarrow{-1} W \xrightarrow{-1} \boxed{V}$$
$$B \xrightarrow{+2} D \xrightarrow{+2} F \xrightarrow{+2} H \xrightarrow{+2} \boxed{J}$$
$$L \xrightarrow{+1} M \xrightarrow{+1} N \xrightarrow{+1} O \xrightarrow{+1} \boxed{P}$$

Hence $\boxed{? = VJP}$

17. AD 17 is related to CF 13 in a certain way. In the same way, EH 29 is related to GJ 25. To which of the following is IL 38 related, following the same logic?

(a) TY 35   (b) TZ 35

(c) KN 34   (d) XZ 34

Ans. (c) : Just as   And

$$A \xrightarrow{+2} C \qquad E \xrightarrow{+2} G$$
$$D \xrightarrow{+2} F \qquad H \xrightarrow{+2} J$$
$$17 \xrightarrow{-4} 13 \qquad 29 \xrightarrow{-4} 25$$

Same as,

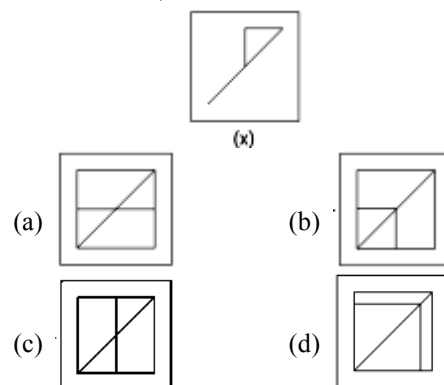$$I \xrightarrow{+2} \boxed{K}$$
$$L \xrightarrow{+2} \boxed{N}$$
$$38 \xrightarrow{-4} \boxed{34}$$

Hence, options (c) is correct.

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

Ans. (c) : In option figure (c), the given figure (X) is embedded as its part.

19. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(23, 60)

(13, 30)

(a) (10, 21)
(b) (12, 28)
(c) (11, 26)
(d) (9, 20)

Ans. (a) : Just as,
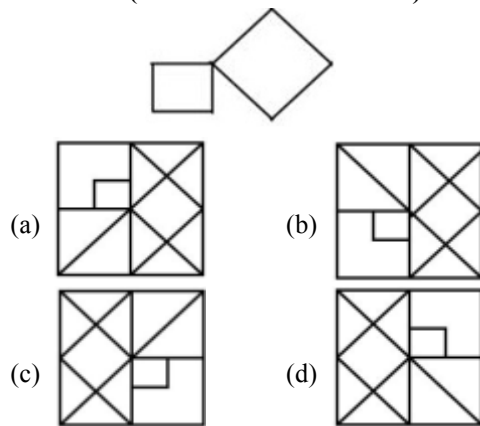   (23, 60)
    $(23 - 3) \times 3 = 60$
And
    (13, 30)
    $(13 - 3) \times 3 = 30$
Same as, from option (a)
    (10, 21)
    $(10 - 3) \times 3 = 21$

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

(a)   (b)

(c)   (d)

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

21. CYTV is related to DZUW in a certain way based on the English alphabetical order. In the same way, GKOS is related to HLPT. To which of the following is BAHG related, following the same logic?
(a) PLIY   (b) ALPO
(c) CBIH   (d) MJGH

Ans. (c) : Just as,

And,

Same as,

22. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.
Statements
Some peacocks are robins
All robins are sparrows
All sparrows are owls
Conclusions
(I) No owl is a peacock
(II) All sparrows are peacocks
(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-
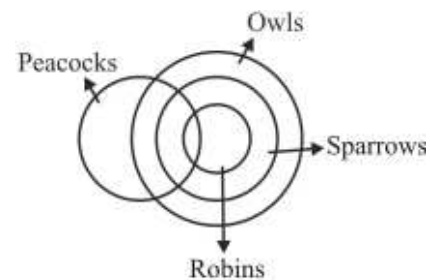
Hence, from the above it is clear that neither conclusion (I) nor (II) follows.

23. What will come in the place of the question mark (?) in the following equation, if '+' and '×' are interchanged and '÷' and '−' are interchanged?
$18 - 6 + 3 \times 20 \div 9 = ?$
(a) 6   (b) 18
(c) 20   (d) 12

Ans. (c) : The given equation is-
    $18 - 6 + 3 \times 20 \div 9 = ?$
According to the question on interchanging the signs-
    $? = 18 \div 6 \times 3 + 20 - 9$
    $= 3 \times 3 + 20 - 9$
    $= 29 - 9$
    $\boxed{? = 20}$

24. In a certain code language, 'CMPX' is coded as 'EONV' and 'WBFK' is coded as 'YDDI'. What is the code for "XAOD" in the given language?
(a) ZCMB   (b) XBMC
(c) YDND   (d) XDOD

Ans. (a) : Just as,

And

Same as,

25. Pillar E is to the east of Pillar D. Pillar A is to the west of Pillar D. Pillar B is to the north of Pillar A. Pillar C is to the south of Pillar A. What is the position of Pillar C with respect to Pillar E?
(a) South   (b) South-West
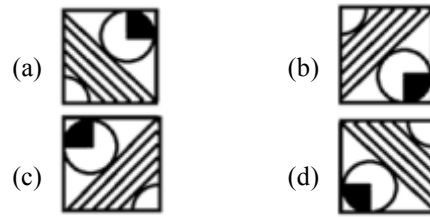(c) North-West   (d) North

Ans. (b) : According to the question-
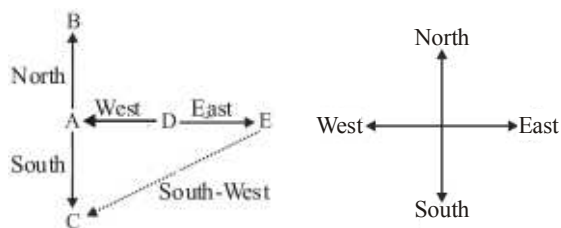
Hence, it is clear from above diagram that pillar 'C' is to the south west of pillar 'E'.

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

(a)   **(b)**

(c)   **(d)**
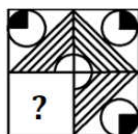
Ans. (d) : Option figure (d) from the given options will complete the pattern of the question figure.

27. What should come in the place of question mark (?) in the given series based on the English alphabetical order?
FOT, HLV, JIX, LFZ, NCB, ?
(a) PZD   (b) MDE
(c) ODC   (d) NCB

Ans. (a) : The given letter cluster series is as follows-
$$F \xrightarrow{+2} H \xrightarrow{+2} J \xrightarrow{+2} L \xrightarrow{+2} N \xrightarrow{+2} P$$
$$O \xrightarrow{-3} L \xrightarrow{-3} I \xrightarrow{-3} F \xrightarrow{-3} C \xrightarrow{-3} Z$$
$$T \xrightarrow{+2} V \xrightarrow{+2} X \xrightarrow{+2} Z \xrightarrow{+2} B \xrightarrow{+2} D$$
Hence $\boxed{? = PZD}$

28. How many triangles are there in the given figure?
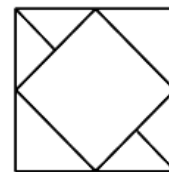
(a) 6   (b) 7
(c) 8   (d) 9

Ans. (c) : The given figure is as follows -
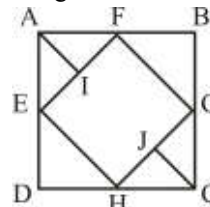
In the given figure triangles are-
ΔAEF, ΔAEI, ΔAFI, ΔFBG, ΔCHG, ΔCHJ, ΔCGJ, ΔDHE
Hence, the total number of triangles are 8.

29. UPSN is related to LGJE in a certain way based on the English alphabetical order. In the same way, WRUP is related to NILG. To which of the following is SNQL related, following the same logic?
(a) JEHC   (b) JECH
(c) EJCH   (d) EJHC

Ans. (a) : Just as,

U	P	S	N
−9↓	−9↓	−9↓	−9↓
L	G	J	E

And

	W	R	U	P
	−9↓	−9↓	−9↓	−9↓
	N	I	L	G

Same as,

	S	N	Q	L
	−9↓	−9↓	−9↓	−9↓
	J	E	H	C

30. Select the correct option that indicates the arrangement of the following words in a logical and meaningful order.
1. Running   2. Crawling
3. Cycling   4. Walking
5. Driving

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

Ans. (b) : On arranging the given words in a logical and meaningful order-
(2) Crawling (4) Walking (1) Running (3) Cycling (5) Driving
Hence, the meaningful order = 2, 4, 1, 3, 5.

31. EJFI is related to KPLO in certain way based on the English alphabetical order. In the same way, INJM is related to OTPS. To which of the following is LQMP related, following the same logic?
  (a) SWRV   (b) RWSV
  (c) SWVR   (d) RWVS

Ans. (b) : Just as,   And

E	J	F	I		I	N	J	M
+6↓	+6↓	+6↓	+6↓		+6↓	+6↓	+6↓	+6↓
K	P	L	O		O	T	P	S

Same as,

	L	Q	M	P
	+6↓	+6↓	+6↓	+6↓
	R	W	S	V

32. 18 is related to 126 following a certain logic. Following the same logic, 28 is related to 196. To which of the following is 48 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/deleting/ 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) 320   (b) 366
  (c) 380   (d) 336

Ans. (d) : Just as,
$$18 \times 7 = 126$$
And, $28 \times 7 = 196$
Same as,
$$48 \times 7 = \boxed{336}$$

33. 23 is related to 69 following a certain logic. Following the same logic, 41 is related to 123. To which of the following is 52 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) 126   (b) 136
  (c) 146   (d) 156

Ans. (d) : Just as,
$$23 \times 3 = 69$$
$$41 \times 3 = 123$$
Same as,
$$52 \times 3 = \boxed{156}$$

34. What should come in place of (?) in the given series based on the English alphabetical order?
ITV, EPR, ALN, WHJ, ?
  (a) QBH   (b) RCH
  (c) QCG   (d) SDF

Ans. (d) : The given series is as follows-
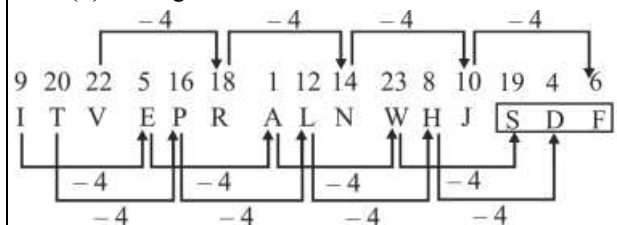
35. E, F, G, H, I, J and K are sitting around a circular table with their backs facing the centre (not necessarily in the same order). J is sitting to the immediate left of G. K is sitting to the immediate right of E. H is sitting to the immediate right of K. I is sitting to the immediate right of H and immediate left of F. F is sitting to the immediate left of J. Who is an immediate neighbour of both E and J?
  (a) K   (b) H
  (c) F   (d) G

Ans. (d) : According to the question, the sitting arrangement is as follows-
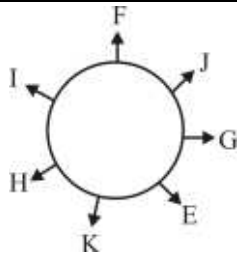
Hence, from the above it is clear that 'G' is an immediate neighbour of both E and J.

36. Vikram walked 10 m towards the north. Then he turned right and walked 20 m. Then he turned right and walked 25 m. Then he turned left and walked 5 m. In what direction is he facing?

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

Ans. (b) : According to the question, the path order of Vikram is as follows-
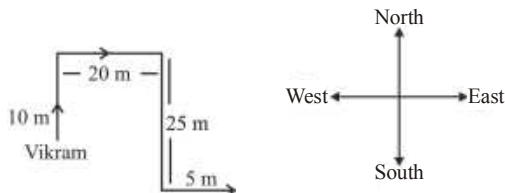
Hence, it is clear from the above that Vikram is facing in East direction.

37. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

(NOTE : Operations should be performed on the whole numbers, without breaking down the numbers into its constituent digits. E. g. 13 - Operations on 13 such as adding/ subtracting/ multiplying etc. 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, 216, 6)
(17, 408, 8)

(a) (8, 86, 12) (b) (14, 210, 5)
(c) (11, 220, 5) (d) (19, 190, 5)

Ans. (b) : Just as,

$216 \div 6 = 36$
$12 \times 3 = 36$

And, $408 \div 8 = 51$
$17 \times 3 = 51$

Same as, from option (b)-

$210 \div 5 = 42$
$14 \times 3 = 42$

Hence, option (b) is correct

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

FDI, HEK, JFM, LGO,?

(a) NHQ (b) MHQ
(c) NOP (d) MNQ

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

$$F \xrightarrow{+2} H \xrightarrow{+2} J \xrightarrow{+2} L \xrightarrow{+2} \boxed{N}$$
$$D \xrightarrow{+1} E \xrightarrow{+1} F \xrightarrow{+1} G \xrightarrow{+1} \boxed{H}$$
$$I \xrightarrow{+2} K \xrightarrow{+2} M \xrightarrow{+2} O \xrightarrow{+2} \boxed{Q}$$

Hence $\boxed{? = NHQ}$

39. OKRN is related to UQXT in a certain way based on the English alphabetical order. In the same way, KGNJ is related to QMTP. To which of the following is NJQM related, following the same logic?

(a) TPWS (b) TPSW
(c) PTWS (d) PTSW

Ans. (a) : Just as, And

Same as,

40. In a certain code language, 'bring him here' is coded as 'gy ct bo' and 'here is there' is coded as 'bo di yk'. How is 'here coded in the given language?

(a) ct (b) yk
(c) gy (d) bo

Ans. (d) : From the question-

Hence, it is clear from the above that, code of 'here' will be 'bo'

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

GCR, HEU, IGX, JIA, ?

(a) JMC (b) MNB
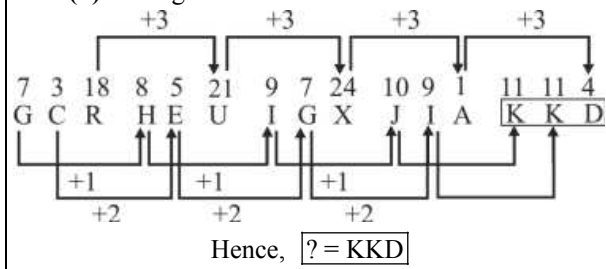(c) GLC (d) KKD

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

Hence, $\boxed{? = KKD}$

42. A, B, D, E , F and G are seven students from a college who appeared for an exam and scored different marks each. D scored the second highest marks. C scored immediately lower marks than D and immediately higher marks than F. E scored higher than only B. G scored less marks than four of the fellow students. Who scored the highest marks?

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

Ans. (c) : According to the question,

Student	Place
A	1
D	2
C	3
F	4
G	5
E	6
B	7

Hence, it is clear that 'A' scored the maximum marks.

43. If A means +, B means –, C means × and D means ÷, then what will come in place of the questions mark (?) in the following equation?
7 C 5 B 32 D 8 A 6 = ?

  (a) 37   (b) 31
  (c) 35   (d) 33

Ans. (a) : Given equation :-
7 C 5 B 32 D 8 A 6 = ?
According to the question on replacing the letters from the given symbols-
$? = 7 \times 5 - 32 \div 8 + 6$
$? = 35 - 4 + 6$
$? = 41 - 4$
$? = 37$

44. Select the option in which the given figure is embedded (rotation is NOT allowed).
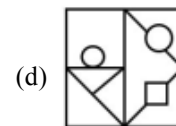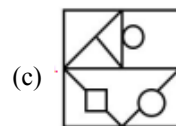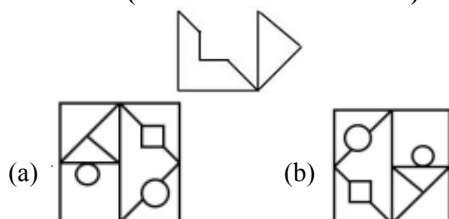
Ans. (b) : The given question figure is embedded in the option figure (b).

45. 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.)
Hematologists : Blood
  (a) Oncologist : Cancer
  (b) Pathologist : Eye
  (c) Nephrologist : Nervous System
  (d) Cardiologist : Lungs

Ans. (a) : Just as, 'Hematologist' deals exclusively with various disorders of the 'Blood', similarly, ' Oncologists ' deals with 'Cancer'.

46. Select the figure from the options that can replace the question mark (?) and complete the given pattern.
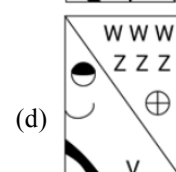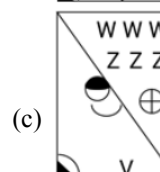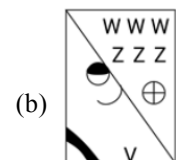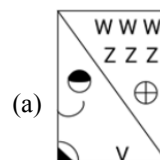
Ans. (a) : Option figure (a) will be appropriate figure to complete the pattern of given question figure, which is also the mirror image of the given pattern.

47. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow (s) from the statements.
Statements: Some bowls are spoons. All spoons are plates.
Conclusion 1: Some spoons are bowls.
Conclusion 2: some bowls are plates.

(a) Only conclusion (1) follows.

(b) Only conclusion (2) follows.

(c) Both conclusions (1) and (2) follow.

(d) None of the conclusions follow.

Ans. (c) : According to the statement, the Venn-diagram is as follows-
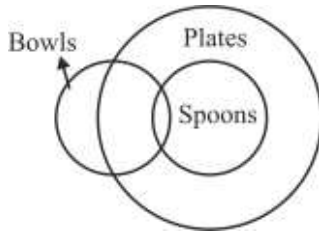
Hence, from the above it is clear that both conclusions 1 and 2 follows.

48. Select the option that indicates the arrangement of the following words in meaningful and logical order.

1. Town   2. Village

3. Country   4. State

5. City

(a) 1, 3, 2, 4, 5   (b) 2, 1, 5, 4, 3

(c) 5, 1, 3, 2, 4   (d) 4, 1, 3, 2, 5

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

(2) Village (1) Town (5) City (4) State (3) Country

Hence, option (b) is correct.

49. In a certain code language,

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

'A – B' means 'A is the brother of B'

'A × B' means 'A is the sister of B' and

'A ÷ B' means 'A is the husband of B'

How is F related to Z if 'D ÷ F × G ÷ H + N – Z' ?

(a) Father's sister

(b) Husband's sister

(c) Sister

(d) Mother's sister

Ans. (a) : According to the question, on the basis of given expression the blood relation diagram is as follows-
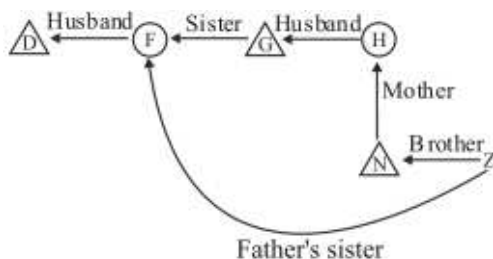
Hence, from the above it is clear that F is the sister of z's father.

50. A, B, C, D, E, F, and G are sitting around a circular table, facing the centre (not necessarily in the same order). Only 2 people sit between A and D when counted from the left of A. E sits to the immediate left of D. G sits to the immediate left of B. G is not an immediate neighbour of D. F sits to the immediate left of C.

What is the position of B with respect to C?

(a) Third to the left

(b) Second to the left

(c) Third to the right

(d) Second to the right

**Ans. (c) :** According to the question, sitting arrangement is as follows-
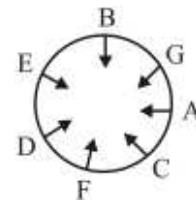
It is clear from the above that B is third to the right of 'C'. Hence option (c) is correct

General Awareness

1. Which is the essential non-justiciable feature of the Indian Constitution associated with the welfare and well-being of the common man?

(a) Directive principles of State Policy

(b) Fundamental Rights

(c) Federalism

(d) Parliamentary Sovereignty

Ans. (a) : The essential non-justiciable Feature of the Indian Constitution associated with the welfare and Well-being of the common man is the Directive Principles of State Policy. The Directive Principles of State Policy are described in Articles 36 to 51 in Part-IV of the Indian Constitution. It has been taken from the Constitution of Ireland.

2. Why is it always emphasised NOT to touch any electric switch board with wet hands?

(a) Water can erode the switchboard.

(b) Combination of water and our body is a good conductor of electricity.

(c) Wet hands can fade away the colour coat of the switchboard.

(d) Wet hands might slip from the switch.

Ans. (b) : Touching electrical appliances with wet hands is dangerous because water is a good conductor of electricity and one might get an electric shock. Therefore, it is always emphasized not to touch any electric switch board with wet hands.

3. Where in India was the Indian music director and classical flautist Pandit Hariprasad Chaurasia born?
(a) Jhansi   (b) Bihar
(c) Prayagraj   (d) Banaras

Ans. (c) : Hari Prasad Chaurasia (who was born on 1 July, 1938) is an Indian music director and classical flautist, who plays the bansuri, in the Hindustani classical tradition. He was born in Allahabad (now Prayagraj) to a wrestler father. At the age of 15, he took up the flute under the mentorship of Bholanath Prasanna of Varanasi for the next eight years. He belonged to the Senia Gharana.

4. Which of the following health campaigns was launched by President Draupadi Murmu through a virtual event on 13 September 2023?
(a) Ayushman Bhav
(b) Ayurveda for One Health
(c) Yoga for Mental Health
(d) Health For All

Ans. (a) : On September 13, 2023, the country's President Draupadi Murmu virtually launched the Visionary health program 'Ayushman Bhava' campaign online to make access to health services accessible across the country. Under this scheme, Ayushman cards will be given to all the remaining eligible beneficiaries under the Pradhanmantri Jan Arogya Yojana.

5. The Project Great Indian Bustard was launched by the Government of _____ in June 2013.
(a) Rajasthan   (b) Bihar
(c) Uttarakhand   (d) Manipur

Ans. (a) : The Great Indian Bustard Project was launched by the Rajasthan Government in June 2013. The Great Indian Bustard, the state bird of Rajasthan, is considered India's most critically endangered bird. The Rajasthan Government launched this project to breeding the species, build enclosures and reduce human interference on their habitats.

6. Which of the following is a function of the cytoskeleton?
(a) Protein synthesis
(b) Cell division
(c) ATP production
(d) Cell support and shape

Ans. (d) : The function of the Cytoskeleton is to support the cell and maintain its shape. The Cytoskeleton is found in the cytoplasm of the cell, which helps to keep the cellular organelles in their place. It help in the development of vacuoles.

7. The Government launched a 'Scheme for Expansion and Modernisation of Fire Services in the States' in July 2023 under the _____ for strengthening fire services in the States.

(a) National Disaster Response Fund (NDRF)
(b) National Disaster Relief Fund (NDRF)
(c) National Disaster Regulation Fund (NDRF)
(d) National Disaster Research Fund (NDRF)

Ans. (a) : The Government has launched a 'Scheme for Expansion and Modernization of Fire Services in the States in July, 4, 2023 from the earmarked allocation of Preparedness and Capacity Building Funding Window under the National Disaster Response Fund (NDRF). For strengthening fire services in the states.

8. Which of the following is a popular cloud storage service on the internet?
(a) Microsoft Word   (b) Google Drive
(c) Adobe Photoshop   (d) Internet Explorer

Ans. (b) : Google Drive is a popular cloud storage service on the Internet. Google Drive is a free service from Google that allows to store files online and access them anywhere using the cloud. It also gives access to free web based applications for creating documents, spreadsheets.

9. Which of the following schemes focuses on reduced imports, increased exports and grassroot campaigns that support local initiatives towards self-reliance?
(a) Samarth Scheme   (b) Vocal for Local
(c) Mission Karmayogi   (d) Skill India Mission

Ans. (b) : 'Vocal for Local' schemes focuses on reduced imports, increased exports and grassroot campaigns that support local initiatives towards self - reliance. 'Vocal for Local' is a concept that urges Indians to back native products, stimulating economic advancement and self-sufficiency. It is an online platform for public procurement, which was launched in 2016 by the Ministry of Commerce and Industry, Government of India.

10. Which of the following is a colourless liquid whose formula is $CHCl_3$ which evaporates rapidly and turns into gas?
(a) Ethanol   (b) Acetone
(c) Chloroform   (d) Ammonia

Ans. (c) : Chloroform ($CHCl_3$) is a colorless liquid with a pleasant, nonirritating odor and a slightly sweet taste. It will burn only when it reaches very high temperatures. Chloroform evaporates very quickly with exposure to air.

11. Which group of beneficial bacteria is commonly used in fermented dairy products?
(a) Staphylococcus aureus
(b) Streptomyces rhizobium
(c) Campylobacter jejuni
(d) Lactobacillus acidophilus

Ans. (d) : Lactic acid bacteria (LAB) species are grouped into several genera under the Lactobacillaceae family. Although Lactic acid bacteria include more than 60 genera, the most frequent genera in food fermentation generally include Lactobacillus acidophilus, which are beneficial organisms which are crucial in the fermentation of milk and milk products. The quality of milk may be improved by fermentation, and it can also be preserved and harmful bacteria removed from milk through fermentation.

12. **It is difficult to carry a heavy shopping bag with thin handles by hand, but slightly easier when the handles are covered with a thick piece of cloth. What is the reason behind that?**
  (a) Handles become stronger
  (b) Cloth is colourful
  (c) Increase in surface area reduces the force exerted
  (d) Chances of tearing are eliminated

Ans. (c) : It is difficult to carry a heavy shopping bags with thin handles by hand, but it slightly easier when the handles are covered with a thick cloth because pressure is inversely proportional to area, so an increase in the surface area means a decrease in pressure.

13. **A milliamp is a unit of measurement of electric current, which is equal to how many amps?**
  (a) 0.01 AMP
  (b) 0.001 AMP
  (c) 0.0001 AMP
  (d) 0.00001 AMP

Ans. (b) : The milliamp (mA) is equal to 1/1000 of an ampere (A) and is abbreviated as:-
  1A = 1000mA
  Or 1 mA = 0.001A

14. **What is the primary reason for a government to implement a Goods and Services Tax (GST)?**
  (a) To increase the complexity of the tax system
  (b) To simplify the tax structure
  (c) To eliminate all indirect taxes
  (d) To discourage all kinds of consumption

Ans. (b) : The idea of a nation wide GST (Goods and Services Tax) in India was first proposed by the Kelkar committee in 2000. The objective was to replace the prevailing complex and fragmented tax structure with a unified system that would simplify compliance, reduce tax cascading, and promote economic integration. GST is an indirect tax levied on the supply of goods and services in India. GST was implemented in India from 2017.

15. **Which of the following trees is NOT found in the tropical evergreen forests of India?**
  (a) Ebony   (b) Amaltas
  (c) Mahogany   (d) Rosewood

Ans. (b) : Amaltas tree is not found in the tropical evergreen forests. Tropical Evergreen Forests are found in the western slopes of the Western Ghats, hills of the north eastern region and the Andaman and Nicobar Islands. They are found in warm and humid areas with an annual precipitation of over 200 cm and mean annual temperature above 22°C. Species found in these forests include rosewood, mahogany, aini, rubber, cinchona, ebony etc. Amaltas found both in dry deciduous as well as moist deciduous forests.

16. **Which of the following is an important step towards offering primary education to all children between the ages of 6 and 14?**
  (a) Mid-day meal
  (b) Adult Education Programme
  (c) Sarva Siksha Abhiyan
  (d) Rashtriya Madhyamik Shiksha Abhiyan

Ans. (c) : Sarva Siksha Abhiyan is a significant step towards providing elementary education to all children in the age group of 6-14 years. It is an Indian government program launched in 2001. In 2002, the 86th Amendment to the constitution made elementary education of fundamental right and in 2009, the Parliament passed the Right to Education Act and it came into force in 2010.

17. **Who was honoured with the National Kalidas Samman 2022 award for sitar playing?**
  (a) Purbayan Chatterjee
  (b) Niladri Kumar
  (c) Budhaditya Mukherjee
  (d) Nishat Khan

Ans. (c) : Budhaditya Mukherjee was awarded the 2022 National Kalidas Samman Award for Sitar playing. Kalidas Samman is awarded annually by the Government of Madhya Pradesh. Kalidas Samman was started in 1980-81. At present, Uday Bhawalkar has been awarded the National Kalidas Samman for the year 2023-24.

18. **The Arabian Sea is connected to the Red Sea, through the Strait of Bab-el-Mandeb and the Gulf of Eden, and the Persian Gulf via the _____.**
  (a) Gulf of Alaska
  (b) Gulf of Oman
  (c) Gulf of Riga
  (d) Gulf of Mexico

Ans. (b) : Arabian Sea is the Indian Ocean's largest marginal sea. It is connected to the Red Sea, through the strait of Bab-el-Mandeb and the Gulf of Eden, and the Persian Gulf via the Gulf of Oman. The Arabian Sea is a northwestern arm of the Indian Ocean.

19. According to which of the following constitutional articles in India does the government need to present the estimated receipts and expenditures before the parliament?
   (a) Article 212   (b) Article 112
   (c) Article 312   (d) Article 412

Ans. (b) : Under Article 112 of the Constitution, a statement of estimated receipts and expenditure of the Government of India has to be laid before Parliament in respect of every financial year which runs from 1st April to 31st March.

20. Which of the following is/are Pteridophyta?
   (a) Hornworts   (b) Fern
   (c) Mosses   (d) Lichens

Ans. (b) : Fern, Selaginella, Equisetum and Salvinia comes under pteridophytes. Pteridophytes are used for medicinal purposes and as soil-binders. Pteridophytes are considered as the first plants to be evolved on land. These plants have a vascular system and they reproduce through spores. They are known as Cryptogams.

21. Under which of the following ministries does 'VAIBHAV' Fellowship Programme announced by the Government of India in June 2023 ?
   (a) Ministry of Human Resource Development
   (b) Ministry of Urban Development
   (c) Ministry of Science & Technology
   (d) Ministry of Urban Development

Ans. (c) : The 'Vaibhav' Fellowship Programme announced by the Government of India in June 2023 comes under the Ministry of Science and Technology. The VAIBHAV Fellowship aims at improving the research ecosystem of India's Higher Educational and Scientific Institutions by facilitating academic and research collaborations between Indian Institutions and the best institutions in the world through mobility of faculty/researchers from overseas institutions to India.

22. Limitations Law of 1859 is related to which of the following?
   (a) Arms   (b) Social Reform
   (c) Indigo cultivation (d) Loan Bond

Ans. (d) : The Limitations Law, which was passed by the British in 1859, related to Loan bonds signed between moneylenders and Ryots would have validity only for three years.

23. Who called off the Non-Cooperation Movement due to the Chauri Chaura incidence?
   (a) Lala Lajpat Rai
   (b) Mahatma Gandhi
   (c) Rajendra Prasad
   (d) Chittaranjan Das

Ans. (b) : On 4th February, 1922 Chauri Chaura, a town in Gorakhpur (Uttar Pradesh) witnessed a violent incident a large crowd of peasants set on fire a police station that killed 22 policemen. Due to this incident, Mahatma Gandhi called off the Non-Cooperation Movement (1920-22).

24. Some simple multicellular organisms reproduce by first splitting into multiple pieces. Then each of these pieces grow up into a new individual. What is this method of reproduction known as?
   (a) Reproduction   (b) Binary fission
   (c) Multiple fission   (d) Refutation

Ans. (d) : Some simple multicellular organisms reproduce by first splitting into multiple pieces. Then each of these pieces grow up into a new individual. This method of reproduction known as Refutation.

25. Which of the following demineralises the enamel of the teeth?
   (a) Toothpaste
   (b) Acids produced by bacteria
   (c) Saliva
   (d) Soft toothbrush

Ans. (b) : Tooth erosion happens when acids wear away the enamel on teeth. Tooth enamel, made up of Calcium hydroxyapatite is the hardest substance in the body. If we take too many soft drinks, which have lots of phosphoric and citric acids. Bacteria, Streptococcus mutans, found in the mouth thrive on sugar and they make acids that can eat away at enamel.

26. Which of the following are the features of the Parliamentary form of government?
   1. The President is the nominal or de jure executive.
   2. The Prime Minister is the titular executive.
   3. The President is the head of state.
   4. The Prime Minister is the head of government.
   (a) Only 1, 3 and 4
   (b) Only 1, 2 and 3
   (c) Only 1, 2 and 4
   (d) Only 2, 3 and 4

Ans. (a) : Parliamentary system has been taken from the United kingdom because U.K. constitution is the mother constitution of parliamentarianism. It is also called ministerial or cabinet system. Cabinet or parliamentary form of government is that in which:-
(i) The President is a nominal executive.
(ii) The President is the head of state.
(iii) The Prime Minister is the head of the government.
(iv) The council of Ministers is collectively responsible to the Lok Sabha.
(v) Cabinet is responsible before the legislature.

27. What is the meaning of the word 'Taraf' under the Bahmani Sultanate?
(a) Province   (b) Merchant
(c) Horse   (d) Tax

Ans. (a) : Bahmani Kingdom (1347-1526AD) was established by Alauddin Hasan Bahman Shah (Hasan Gangu) in 1347. The Bahmani Kingdom is also recognized as the first Muslim kingdom in the Deccan region. Bahman Shah divided his kingdom into 4 provinces i.e. Gulbarga, Berar, Bidar and Daulatabad. Each of these provinces was called taraf, and the officer incharge was called the tarafdar.

28. Which disease causes bone pain, stunted growth and soft, weak bones that can lead to skeletal deformities due to not having enough vitamin D?
(a) Rickets   (b) Pertussis
(c) Dementia   (d) Polio

Ans. (a) : Rickets is a bone disease that affects infants and young children causes bone pain, stunted growth and soft, weak bones that can lead to skeletal deformities due to not having enough vitamin D.

29. The Rourkela Steel plant was set up in the year _____ in Odisha state.
(a) 1973   (b) 1959
(c) 1955   (d) 1969

Ans. (b) :

Name	Estb. Year	State
• Rourkela Steel Plant	1959	Odisha
• Bhilai Steel Plant	1955	Chhattisgarh
• Bokaro Steel Plant	1964	Jharkhand
• Durgapur Steel Plant	1959	West Bengal

30. In which of the following Articles is fundamental duties, like protecting public property and renouncing violence, stated?
(a) Article 11 A   (b) Article 36 A
(c) Article 51A   (d) Article 72 A

Ans. (c) : The Indian Constitution includes a single Article, Article 51A in Part IV-A, which deals with Fundamental Duties. These duties were added through the 42nd Amendment Act in 1976, outlining 11 Fundamental Duties for citizens. Under Article 51A fundamental duties, like protecting public property and renouncing violence, stated.

31. Name a sublimable substance that can be converted into gas without passing through any intermediate liquid phase.
(a) Chalk Powder   (b) Naphthalene
(c) Alum   (d) Rust

Ans. (b) : Sublimation is the process by which a solid transforms into a gas without first becoming a liquid. Sublimates are chemicals that are undergoing sublimation. Ammonium Chloride is white solid on heating it sublimes and Naphthalene balls are the two examples of substance that sublimes.

32. Who can operate a blog?
(a) Only individuals
(b) Only large corporations
(c) Individuals or small groups of people
(d) Only businesses

Ans. (c) : Individuals or small groups of people can operate a blog. Blogger is a free blog hosting service by Google. Blogs are a great way to keep a website updated with fresh content.

33. Pramila Malik was in news to become the first woman speaker of which state assembly in September 2023?
(a) Odisha   (b) Gujarat
(c) Karnataka   (d) Jharkhand

Ans. (a) : In September 2023, Pramila Malik was in news to become the first woman speaker of Odisha. She represents Biju Janata Dal. She won the 2024 Odisha Legislative Assembly election.

34. If a windmill farm has to be set up, setting up it near a coastal area seems like a good idea. What could be the main reason behind this?
(a) No water scarcity
(b) Heavily populated
(c) Land and sea breezes
(d) Chances of storms

Ans. (c) : If a windmill farm has to be set up, setting up it near a coastal area seems like a good idea. Land and sea breezes could be the main reason behind this because there areas usually have strong and consistent winds that can be used to generate electricity.

35. Which of the following is the chemical formula of baking soda?
(a) $Na_2CO_3 10H_2O$ (b) $NaOH$
(c) $CaOCl_2$ (d) $NaHCO_3$

Ans. (d) : Baking soda is the common name of sodium bicarbonate. The Chemical formula of baking soda is $NaHCO_3$. Baking Soda is used as a neutralizer to neutralize the effect of acid. It reduces the acidity in the stomach.

36. Who said, "A single shelf of a good European library was worth the whole native literature of India and Arabia"?
(a) William Jones   (b) Thomas Macaulay
(c) Max Mueller   (d) W Hunter

Ans. (b) : "A single shelf of a good European library was worth the whole native literature of India and Arabia" was told by Thomas Babington Macaulay. On February 2, 1835 he circulated 'Minute on Indian Education', a treatise that offered definitive reasons for why the East India Company and the British government should spend money on the provision of English language educations as well as the promotion of European learning.

37. Prime Minister Narendra Modi officially launched the Central Sector Scheme _____, for artisans and crafts persons across India in September 2023.
 (a) PM Hastshilpi (b) PM Kaamgaar
 (c) PM Karigar (d) PM Vishwakarma

Ans. (d) : Prime Minister Narendra Modi officially launched the Central Sector Scheme PM Vishwakarma for artisans and crafts persons across India in September 2023. Under the scheme, the artisans can register in the PM Vishwakarma portal using biometrics. The scheme will be available for traditional craft's people and artisans for five financial years from 2023-24 to 2027-28.

38. In which location were the inaugural National Games, previously known as the 'All India Olympic Games, held before the independence of India?
 (a) Lahore (b) Poona
 (c) Bombay (d) Patiala

Ans. (a) : The All India Olympic Committee organized the first National Games before independence in 1924 in Lahore. It was then called the 'All India Olympic Games.' The four editions of the Games were held every two years since 1924, with the first three being held in Lahore and Allahabad was the host in 1930.

39. What is the minimum age prescribed for a person to be eligible to become Vice-President of India?
 (a) 25 years (b) 30 years
 (c) 35 years (d) 40 years

Ans. (c) : The office of Vice President is the second highest constitutional office in India. As per Article 66 of the Constitution of India, the Vice-President is elected by the members of the Electoral College. The eligibility to be elected as Vice President are :-
(i) Should be a citizen of India.
(ii) Should have completed 35 years of age.
(iii) Should be qualified for election as a member of the Rajya Sabha.
(iv) Should not hold any office of profit under the Union Government or any state government.

40. Which of the following animals is NOT a mammal?
 (a) Lizard (b) Dolphin
 (c) Elephant (d) Bat

Ans. (a) : Lizard is not a mammal because this is a reptile, a cold-blooded animal that is unable to internally control its own body temperature. Mammals have hair or fur; are warm-blooded; most are born alive, the young are fed milk produced by the mother's mammary glands.

41. Mr Ajit Pawar became the Deputy Chief Minister of which state on 2nd July 2023?
 (a) Goa (b) Maharashtra
 (c) Gujarat (d) Rajasthan

Ans. (b) : On 2 July, 2023 Mr. Ajit Pawar became the Deputy Chief Minister of Maharashtra. At present, Eknath Shinde is the 20th Chief Minister of Maharashtra.

42. According to Census of India 2011, in which Union Territory was the highest population growth rate recorded?
 (a) Dadra and Nagar Haveli
 (b) Daman and Diu
 (c) Andaman and Nicobar Islands
 (d) Chandigarh

Ans. (a) : According to Census of India 2011, the Union Territory with highest population growth rate was Dadra and Nagar Haveli with a growth percentage of 55.50%. Lakshadweep is the Union Territory with lowest rate of growth which is 6.23%

43. Vitamin B 12 is also known as:
 (a) biotin
 (b) cyanocobalamin
 (c) pantothenic acid
 (d) pyridoxine

Ans. (b) :

<u>Vitamins</u>	<u>Chemical names</u>
• Vitamin B$_{12}$	Cyanocobalamin
• Vitamin B$_7$	Biotin
• Vitamin B$_5$	Pantothenic acid
• Vitamin B$_6$	Pyridoxine
• Vitamin B$_3$	Niacin

44. According to Census of India 2011, which of the following states recorded a population density of more than 1100 persons per km^2?
 (a) Rajasthan (b) Punjab
 (c) Kerala (d) Bihar

Ans. (d) : According to census of India 2011, Bihar is the most thickly populated state (1106 persons/sq.km.) followed by West Bengal (1028) and Kerala (860). Population density increased at the rate of 17.54 from 2001 to 2011.

45. What makes countries near the equator hotter than those which are away from the equator?
 (a) Areas near the equator receive direct and more sunlight.
 (b) The equator is near the earth's core.
 (c) The equator is a hot line.
 (d) Areas near the equator have more volcanoes.

Ans. (a) : Countries located near the equator experience hot weather throughout the year. It is because the sun remains almost directly overhead everyday. Due to the spherical shape of the Earth, sunlight falls on different parts at different angles.

46. What is the purpose of 'customs duty' in international trade?
(a) To encourage unlimited imports
(b) To protect domestic industries by taxing imports
(c) To standardise products internationally
(d) To regulate the export of goods

Ans. (b) : Customs duty refers to the tax imposed on goods when they are transported across international borders. The purpose of 'customs duty' in international trade to protect domestic industries by taxing imports. The government uses this duty to raise its revenues, safeguard domestic industries and regulate movement of goods.

47. Dribbling skills are NOT used in which of the following sports?
(a) Basketball   (b) Hockey
(c) Football   (d) Chess

Ans. (d) : Dribbling skills are not used in chess. Chess is an intellectual entertaining game played between two players. In a chess game, each player has 16 pieces. The chessboard has a total of 64 squares.

48. Which freedom is protected by Article 19(d) of the Constitution?
(a) Freedom to assemble peacefully
(b) Freedom of speech and expression
(c) Freedom to move freely throughout the territory of India
(d) Freedom to reside and settle in any part of India

Ans. (c) : Article 19(1) (d) ensures the right to move freely throughout the territory of India. Citizens have the liberty to move within the country, reside in any part of India, and settle in any place of their choice. There is provision of six types of freedom under Article 19, which are as follows:-
(a) to freedom of speech and expression.
(b) to assemble peaceably and without arms.
(c) to form associations or unions.
(d) to move freely throughout the territory of India.
(e) to reside and settle in any part of the territory of India.
(f) to practice any profession, or to carry on any occupation, trade or business.

49. If Wildlife sanctuaries are there to protect wild animals, then what do biosphere reserves protect?
(a) Water animals of the area
(b) Entire biodiversity of the area
(c) Native trees and plants
(d) Forests of the area

Ans. (b) : Wildlife sanctuaries protect wild animals, while biospheres conserve the diversity of flora and fauna within a region. Biosphere reserves protect the entire biodiversity of the area. However, National parks preserve historical antics, flora, and fauna under the complete ecosystem.

50. A cricket ball of mass 160 grams was dropped from a height of 50 meters. What would be its kinetic energy just before touching the ground? [use the value of acceleration due to gravity as 10 m/s^2]
(a) 50 joules   (b) 80 joules
(c) 8 joules   (d) 160 joules

Ans. (b) : Given -
Mass of cricket ball = 160 gram

$$= \frac{160}{1000} \text{ kg}$$

$$= \frac{4}{25} \text{ kg}$$

Height (h) = 50 meters
Gravity (2) = 10 m/s^2
Hence, $E_k = mgh$

$$= \frac{4}{25} \times 10 \times 50$$

= 80 Joules

Section : General Engineering Electrical

1. In a fixed bias circuit silicon NPN transistor, common emitter configuration with β = 50 is used. Calculate V_{CE} at quiescent point when $R_B = 10^6 \Omega, R_C = 5$ kΩ and $V_{CC} = 10V$.
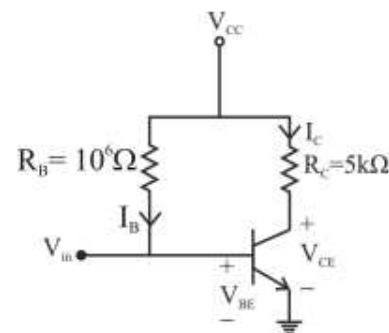(a) 7.67 V   (b) 6.67 V
(c) 8.50 V   (d) 7.50 V

Ans. (a) : Given,
$R_B = 10^6 \Omega$, β = 50
$R_C = 5k\Omega$, $V_{CC} = 10V$
Fixed bias circuit:

$$I_B = \frac{V_{CC} - V_{BE}}{R_B} = \frac{10 - 0.7}{10^6} = 9.3\mu A$$

And,

$$I_C = \beta I_B = 50 \times 9.3 = 465\mu A$$

$$V_{CE} = V_{CC} - I_C R_C = 10 - 465 \times 10^{-6} \times 5 \times 10^3$$

$$V_{CE} = 10\text{–}2.325 = 7.675 \text{ Volt}$$

$$\boxed{V_{CE} = 7.675\,\text{Volt}}$$

2. **The average power delivered to an AC series circuit is given by:**

(a) $I_{max} \times V_{max} \times \sin\theta$ (b) $V_{rms} \times I_{rms}\cos\theta$

(c) $I_{max} \times V_{max}$ (d) Zero

Ans. (b) : The average power delivered to an AC series circuit is given by:

$$\boxed{P_{avg} = V_{rms}.I_{rms}\cos\theta}$$

• Reactive power $(Q) = V_{rms}. I_{rms}. \sin\theta$

3. **Which of the following statements is/are correct regarding superposition theorem?**

(a) It can be used to calculate voltage, current and power.

(b) It can be used to calculate voltage and current in a circuit containing resistor, capacitor, inductor and diode.

(c) It can be used to calculate current in a circuit having linear elements resistor, capacitor and inductor.

(a) (a), (b) and (c)   (b) (c) only

(c) (c) and (b) only   (d) (a) and (d) only

Ans. (b) : Superposition theorem is used to find the voltages and currents. It can be used to calculate current in a circuit having linear elements such as resistor, capacitor and inductor.

• Superposition theorem is not applicable for power calculation.

Hence, only statement (c) is correct.

4. **In a transistor, the ____ region is the widest and the ____ region is the thinnest of all.**

(a) collector; emitter

(b) emitter; base

(c) base; collector

(d) collector; base

Ans. (d) : In a transistor the collector region is the widest and the base region is the thinnest of all.

• **Doping:** Emitter > Collector > Base

• **Width :** Collector > Emitter > Base

5. **In a capacitor, if a charge of 1 coulomb accumulates on each plate when a potential difference of 1 volt is applied across the plates, then the capacitance will be ____.**

(a) 1 microfarad   (b) 1 farad

(c) 1 nano-farad   (d) 1 picofarad
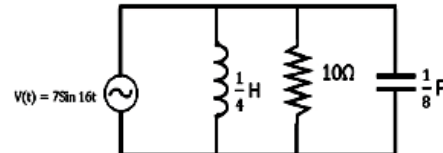
Ans. (b) : Given,

Q = 1 Coulomb

V = 1 Volt, C = ?

We know that,

$$C = \frac{Q}{V}$$

$$C = \frac{1}{1} = 1\,\text{Farad}$$

$$\boxed{C = 1\,\text{Farad}}$$

6. **The susceptance of the circuit given in the diagram is ____.**

(a) $\dfrac{j7}{4}S$ (b) $\dfrac{j4}{7}S$

(c) $\left(\dfrac{1}{10} - \dfrac{j7}{4}\right)S$ (d) $\left(\dfrac{1}{10} + \dfrac{j7}{4}\right)S$

Ans. (a) : From the circuit diagram:

$$V(t) = 7\sin 16t \quad \Rightarrow \omega = 16 \text{ rad/sec}$$

$$L = \frac{1}{4}H, \quad R = 10\Omega, \quad C = \frac{1}{8}F$$

Then,

$$jX_L = j\omega L = j16 \times \frac{1}{4} = j4\Omega$$

$$-jX_C = \frac{-j}{\omega C} = \frac{-j}{16 \times \frac{1}{8}} = \frac{-j1}{2}\Omega$$

Admittance $(Y) = \dfrac{1}{R} + \dfrac{1}{j\omega L} + j\omega C$

$$Y = \frac{1}{10} + \frac{1}{j4} + j2$$

$$Y = \frac{1}{10} + j\left(2 - \frac{1}{4}\right)$$

$$Y = \frac{1}{10} + j\frac{7}{4} \quad \left[\because Y = G \pm jB\right]$$

$$\underset{\text{Conductance}}{} \longrightarrow \text{Susceptance}$$

Hence, susceptance $(B) = \dfrac{j7}{4}S$

7. **Stability factors are defined as the rate of change of ____ with respect to the ____, keeping both the base current and the current gain β constant.**

(a) collector base leakage current; collector current

(b) emitter current; collector base leakage current

(c) collector base leakage current; emitter current

(d) collector current; collector base leakage current

Ans. (d) : Stability factors are defined as the rate of change of collector current with respect to the collector base leakage current keeping both the base current and the current gain β constant.

$$\text{Stability factor(S)} = \frac{\partial I_C}{\partial I_{CO}}$$

We know that,

$I_C = \beta I_B + (1+\beta) I_{CO}$ [Partial differentiate w.r.t I_C]

$$1 = \beta \frac{\partial I_B}{\partial I_C} + (1+\beta) \frac{\partial I_{CO}}{\partial I_C}$$

$$\boxed{S = \frac{1+\beta}{1 - \frac{\beta \partial I_B}{\partial I_C}}}$$

8. In electrical circuits, the equivalent resistance of a complicated network of conductors is determined by applying _____.
- (a) Ampere's circuital law
- (b) Laplace's law
- (c) Kirchhoff's law
- (d) the direct method

Ans. (c) : In electrical circuits, the equivalent resistance of a complicated network of conductors is determined by applying Kirchhoff's law.
- Kirchhoff's first law (KCL) states that the total current entering a junction is equal to the total current leaving the junction.
- Kirchhoff's second law (KVL) states that sum of all voltages around a closed loop in any circuit must be equal to zero.

9. Which of the following statements about the hysteresis loop of magnetic materials is correct?
- (a) The area of the hysteresis loop of a hard material is greater than that of the soft material.
- (b) The area of the hysteresis loop of a hard material as well as a soft material is not dependent on temperature.
- (c) The hysteresis loops of hard and soft materials are of the same area.
- (d) The area of the hysteresis loop of a hard material is less than that of the soft material.

Ans. (a) : Hard Magnetic material: The magnetic material that can retain their magnetism even after the removal of external magnetic field, and are difficult to magnetize and demagnetize are known as hard magnetic material.
- The area of hysteresis loop of hard magnetic material is large.

Soft Magnetic Material: The magnetic material that can be easily magnetized and demagnetized are known as soft magnetic material.
- The area of hysteresis loop of soft magnetic material is small.

10. In a drive system, which requires a high starting torque, which of the following electric motors is more suitable?
- (a) Synchronous motor
- (b) Double cage induction motor
- (c) DC Series motor
- (d) DC cumulative compound motor

Ans. (c) : The most suitable electric motor for a drive system that requires a high starting torque is the DC series motor.

In DC series motor, $T \propto \phi I_a$

$$\boxed{T \propto I_a^2} \qquad \left[\because \text{Before saturation, } \phi \propto I_a\right]$$

Where,

I_a = Armature current

ϕ = Flux

11. As per the diffusion principle of street lighting installations, which of the following methods is used to calculate the illumination at any point on the road surface?
- (a) Light flux method
- (b) Watt per square metre method
- (c) Inverse-square law method
- (d) Specular reflection method

Ans. (c) : As per the diffusion principle of street lighting installation, Inverse-square law method is used to calculate the illumination at any point on the road surface.

$$\boxed{I \propto \frac{1}{d^2}}$$

Where,

I = Light intensity (Candela)

d = Distance from light source (m)

12. In an electrostatic instrument, the sensitivity can be increased by _____.
- (a) increasing the distance between the plates
- (b) increasing the area of the plates
- (c) using a phase-shifting capacitor
- (d) using a magnetic damping mechanism

Ans. (b) : In an electrostatic instrument, the sensitivity can be increased by increasing the area of plates. This is because a larger plate area allows for a greater change in capacitance for a given change in distance between the plates which results a larger output signal.

13. In regard to estimation and costing of public lighting, which of the following should be adequate to provide visibility that guarantees for the user the maximum safety and sufficient visual comfort?
 (a) Level of luminance
 (b) Uniformity of luminance
 (c) Optical guidance
 (d) Limitations of glare

Ans. (a) : In regard to estimation and costing of public lighting, level of luminance should be adequate to provide visibility that guarantees for the user, the maximum safety and sufficient visual comfort.

14. the load absorbs maximum power from the source. The current drawn from the source is:
 (a) $\dfrac{E}{R}$ (b) $\dfrac{E}{2R}$
 (c) $\dfrac{2E}{R}$ (d) $\dfrac{4E}{R}$

Ans. (b) : Given,
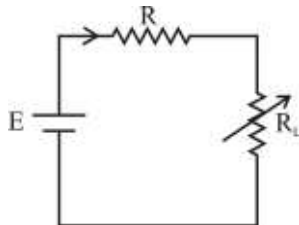
When the load absorbs maximum power from the source then,
$$R_L = R$$
$$\therefore \quad I = \frac{E}{R + R_L} = \frac{E}{2R}$$

$$\boxed{I = \frac{E}{2R}}$$

15. What is the drawback of a Permanent Magnet Moving Coil (PMMC) instrument?
 (a) Absence of effective and efficient current damping
 (b) High power consumption
 (c) Relatively high-cost as compared to moving iron instruments
 (d) Low torque / weight ratio

Ans. (c) : The drawback of a permanent magnet moving coil (PMMC) instrument is relatively high-cost as compared to moving iron (MI) instruments.
• PMMC instrument has least power consumption (25μW to 200 μW) and high torque to weight ratio.
• In PMMC instrument eddy current damping is used.

16. Which of the following types of installations is NOT a part of NEC (National Electrical Code)?

 (a) Agriculture premises
 (b) Sports buildings
 (c) Medical establishments
 (d) Traction

Ans. (d) : The national electrical code (NEC) covers various types of installation, including
(i) Agricultural premises
(ii) Sports building
(iii) Medical establishments
However, traction installation, like electric railways or trolley systems are not part of NEC. Instead, they are governed by the National Electrical Safety Code (NESC).

17. In case of electrical installations, if cable conductors are spiralling, then the resistance /unit length will _____.
 (a) increase (b) decrease
 (c) become zero (d) remain the same

Ans. (a) : In case of electrical installations, if cable conductors are spiralling, then the resistance per unit length will increase.
When cable conductors are spiralling the effective length of the conductor increases due to the spiralling pattern. As a result the resistance per unit length of the conductor increases.

$$\boxed{R = \frac{\rho \ell}{A}\, \Omega}$$

18. In CRO, the measurement of time period is obtained by the product of the number of divisions occupied by one cycle and _____.
 (a) Division/cycle (b) Time/Division
 (c) Division/time (d) Time/cycle

Ans. (b) : In CRO, the measurement of time period is obtained by the product of the number of division occupied by one cycle and time per division.

19. The magnetic flux through a 150 turns coil increases at the rate of 0.08 wb/s. What is the induced EMF between the ends of the coil?
 (a) 120 volts (b) 20 volts
 (c) 12 volts (d) 24 volts

Ans. (c) : Given,
Number of turns (N) = 150, $\dfrac{d\phi}{dt} = 0.08 \,\text{Wb/sec}$

Induced EMF (E) = ?
We know that,
$$E = \frac{N d\phi}{dt}$$
$$E = 150 \times 0.08 = 12V$$
$$\boxed{E = 12\,\text{Volt}}$$

20. Lambert's Cosine Law describes the relationship between _____.
(a) illumination and the distance of light it travels
(b) the wavelength of light and its speed in a medium
(c) total lumen on the work plane and lumen emitted by lamp
(d) illumination and the angle of light incidence on a surface

Ans. (d) : Lambert's cosine law describes the relationship between illumination and the angle of light incidence on a surface.
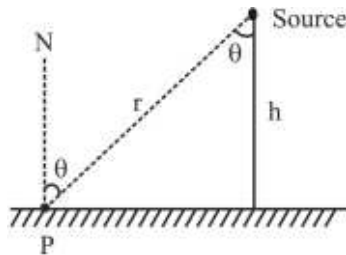
Illumination at point 'P' is given as

$$E_P = \frac{I}{r^2}\cos\theta \quad \text{or} \quad E_P = \frac{I}{h^2}\cos^3\theta$$

21. The polar form of a vector is 10∠30º. What is the rectangular form of this vector?
(a) $\sqrt{3} + j5$ (b) $15\sqrt{3} + j3$
(c) $10\sqrt{3} + j2$ (d) $5\sqrt{3} + j5$

Ans. (d) : Given,
Polar form of a vector = 10∠30º
Rectangular form of this vector = 10cos 30º+ j10 sin 30º
$$= 10 \times \frac{\sqrt{3}}{2} + j10 \times \frac{1}{2}$$
$$= \left(5\sqrt{3} + j5\right)$$

22. A _____ is a failure in a power system of interconnected parts in which the failure of a part can trigger the failure of successive parts.
(a) black out
(b) black out and cascade tripping
(c) brown out
(d) cascade tripping

Ans. (d) : A cascade tripping is a failure in a power system of interconnected parts in which the failure of a part can trigger the failure of successive parts.
● A Black out, also known as power outage, is a complete loss of power in a given area that can caused by an imbalance between power generation and consumption.
● A brown out is a temporary drop in voltage in electrical power system, which can be intentional or unintentional.

23. In the context of magnetic circuits, if a bar magnet is kept on a paper and iron filings are sprinkled around the magnet, then the iron filings form into closed lines. These lines are called lines of _____.
(a) magnetic angle
(b) magnetic fringing
(c) magnetic flux
(d) magnetic motive force

Ans. (c) : In the context of magnetic circuits, if a bar magnet is kept on a paper and iron fillings are sprinkled around the magnet, then the iron filings form into closed lines. These lines are called lines of magnetic flux.

24. Choose the correct alternative regarding an electric iron.
(a) Magnesium oxide powder is used for insulation purposes of the heating element.
(b) The thermostat used in an electric iron makes use of a single metal strip.
(c) The heating element is made up of Chromium.
(d) Halogen bulbs are used in an electric iron.

Ans. (a) : The correct alternative regarding an electric iron is:
● Magnesium oxide powder is used for insulation purposes of the heating element.
The other options are incorrect because:
● The thermostats used in an electric iron makes use of bimetallic strip to sense temperature changes, not a single metal strip.
● The heating element is made up of nichrome (Nickel-chromium) alloy.
● Halogen bulbs are used in lamps.

**25. Which of the following statements are correct about armature leakage reactance of alternator?**
I. It is dependent on load current.
II. It does not depend on load current.
III. It is dependent on the phase angle between armature current and terminal voltage.
IV. It does not depend on the phase angle between load current and terminal voltage.
(a) Only statements I and IV are correct
(b) Only statements I and III are correct
(c) Only statements II and III are correct
(d) Only statements II and IV are correct

Ans. (b) : The following statements are correct about armature leakage reactance of alternator:
● It is dependent on load current, as leakage reactance increases with load current.
● It is dependent on the phase angle between armature current and terminal voltage, as the phase angle effects the leakage reactance.
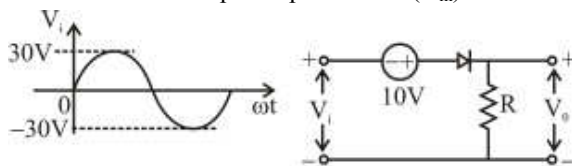
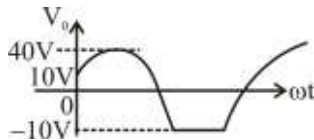**26.** The peak value of the output waveform for the sinusoidal input of 30V peak to the circuit is _____.
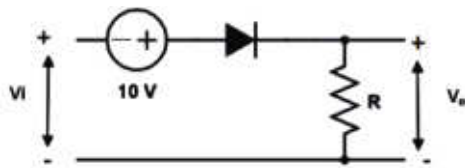
- (a) 30V
- (b) 40V
- (c) 10V
- (d) 20V

Ans. (b) : Given,

Sinusoidal input of peak value (V_m) = 30V

Output waveform (V_0):

Hence, the peak value of the output waveform for the sinusoidal input of 30V peak to the circuit is 40V.

27. What are bushings in transformers used for?
- (a) They are used to cool the transformer oil.
- (b) They are used to insulate the transformer leads as they come out through the tank.
- (c) They are used to connect the transformer to the power grid.
- (d) They are used to filter contaminants from the transformer oil.

Ans. (b) : Bushings in transformers are used to insulate the transformer leads as they come out through the tank. They provide electrical insulation and support leads, ensuring that the high voltage inside the transformer is not exposed to the outside environment. Bushings are typically made of porcelain or epoxy resin.

28. Which of the following statements are true regarding parts of a transformer?
(i) The thickness of laminations varies from 0.35 mm to 0.5 mm.
(ii) The material used for breather is blue in colour when it is damp and whitish pink when dry.
(iii) For a constant input voltage, the output voltage can be varied over a small range by providing few tapings.
- (a) (i) and (iii)
- (b) (i) and (ii)
- (c) (ii) and (iii)
- (d) (i), (ii) and (iii)

Ans. (a) : Transformer:
- The transformer core is generally made of thin strips called laminations to reduce eddy current loss. The thickness of laminations varies from 0.35mm to 0.5mm.
- Silica gel is used to absorb moisture and prevent entering to the oil tank while breathing. The colour of fresh silica gel is blue and moist silica gel became pink in colour.
- For a constant input voltage, the output voltage can be varied over a small range by providing few tapings.

Hence, statements (i) and (iii) are correct.

29. In terms of heating effect of electric appliances, what is the percentage of chromium in the stainless steel coils used in space heaters?
- (a) 10% to 20%
- (b) 13% to 26%
- (c) 15% to 19%
- (d) 17% to 23%

Ans. (b) : In terms of heating effect of electric appliances, the percentage of chromium in the stainless steel coils used in space heaters is 13% to 26%.

30. Which of the following coefficients provides the relationship between the electric field intensity and the transmitted wave to the incident wave in the medium of origin?
- (a) Free space
- (b) Fresnel reflection
- (c) Field reflection
- (d) Signal attenuation

Ans. (b) : The Fresnel reflection coefficient provides the relationship between the electric field intensity and the transmitted wave to the incident wave in the medium of origin.

31. In a solar power plant, the output terminals of the solar photo-voltaic array can be directly connected to the _____.
- (a) DC bus bar
- (b) AC bus bar
- (c) AC to DC converter
- (d) AC load

Ans. (a) : In a solar power plant, the output terminals of the solar photo-voltaic array can be directly connected to the DC bus bar. Then the DC power generated by solar panels is converted into AC power by the inverter. This AC power can then flow to your home appliances or back into the grid.

32. A lamp of 80 watt with efficiency of 80% of watt/CP is suspended, The illumination at a point on a working plane directly below the lamp is 25 lumens/m². Determine the height at which the lamp is suspended ?
- (a) 2 meters
- (b) 3.2 meters
- (c) 4 meters
- (d) 1.6 meters

Ans. (a) : Given that,

Power (P) = 80 watt, Efficiency (η) = 80%

Illumination (E) = 25 lumens/m²

Height of lamp = ?

$$\text{Efficiency (Specific consumption)} = \frac{\text{Watt}}{\text{C.P.}}$$
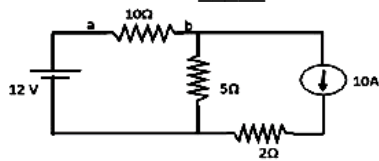
$$80\% = \frac{80}{\text{C.P.}}, \frac{80}{100} = \frac{80}{\text{C.P.}}$$

$$\text{C.P.} = 100, \quad E = \frac{\text{C.P.}}{h^2}$$

$$h^2 = \frac{100}{25}, \quad h^2 = 4$$

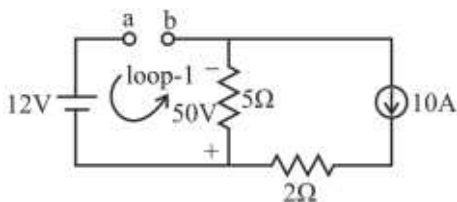$$h = 2m$$

33. The value of Thevenin's voltage across terminal a - b will be _____.

(a) 0 V   (b) 12 V

(c) 62 V   (d) 50 V

Ans. (c) : To find the value of Thevenin's voltage across terminal a-b the resistance 10Ω between terminal a-b will be removed.

Now,

Apply KVL in loop-1,

$$V_a - 12 - 50 - V_b = 0 \Rightarrow V_a - V_b = 62 \text{Volt}$$

$$\boxed{V_{ab} = 62\,\text{Volt}}$$

34. The ring main distribution system is preferred over radial distribution system because _____.

(a) it has fewer voltage fluctuation at consumers side

(b) it always possesses unity power factor

(c) there is no Ohmic loss

(d) there is no requirement of distribution transformer

Ans. (a) : The ring main distribution system is preferred over radial distribution system because it has fewer voltage fluctuations at consumers side.
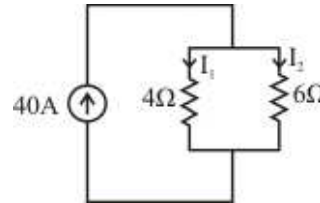
● Ring main system is very reliable as each distribution transformer is fed with two feeders. That means, in the event of a fault in any section of the feeder, the continuity of the supply is ensured from the alternative path.

35. The power dissipated in the 6Ω resistor is _____.
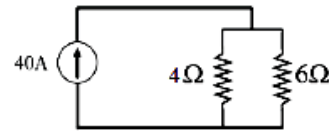
(a) 3456 W   (b) 1024 W

(c) 1536 W   (d) 1000 W

Ans. (c) : Given,

Apply current division rule:

$$I_2 = 40 \times \frac{4}{(4+6)} = 16A$$

Hence the power dissipated in the 6Ω resistor is given by,

$$P = I_2^2 R$$

$$P = (16)^2 \times 6 = 256 \times 6 = 1536W$$

$$\boxed{P = 1536W}$$

36. The calculation of sending and receiving end voltage in an AC ring layout considers the voltage drop of:

(a) inductance alone

(b) resistance alone

(c) capacitance alone

(d) combined effects of resistance, inductance and capacitance

Ans. (d) : The calculation of sending and receiving end voltage in an AC ring layout considers the voltage drop of combined effects of resistance, inductance and capacitance.

37. What do you understand by fundamental period of a signal?

(a) Time taken to complete first cycle of a periodic signal

(b) Time taken to complete every cycle of a periodic signal

(c) Time taken to complete last cycle of a periodic signal

(d) Time taken to complete every cycle of an aperiodic signal
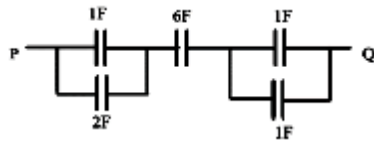
Ans. (a) : The first time interval of a periodic signal after which it repeat itself is called a fundamental period.

For a periodic signal f(t) with fundamental time period 'T' then,
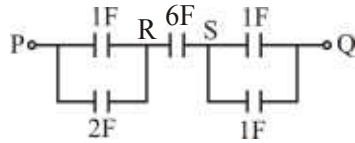
$$\boxed{f(t \pm T) = f(t)}$$

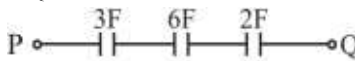**38.** The total capacitance between points P and Q in the figure is:

(a) $\dfrac{46}{6}$ F

(b) 1 F

(c) 11 F

(d) 10 F

Ans. (b) : Given,

$C_{PR} = 1+2 = 3F$

$C_{SQ} = 1+1 = 2F$

Here all capacitances are connected in series, so

$$\frac{1}{C_{PQ}} = \frac{1}{3} + \frac{1}{6} + \frac{1}{2}$$

$$\frac{1}{C_{PQ}} = \frac{2+1+3}{6}$$

$\Rightarrow$ $\boxed{C_{PQ} = 1F}$

39. In case of a p-n junction diode, the change in temperature due to heating _____.

(a) Affects only the reverse resistance of the p-n junction diode

(b) Affects only the forward resistance of the p-n junction diode

(c) Causes no change in the resistance of the p-n junction diode

(d) Affects the entire V-I characteristics of the p-n junction diode

Ans. (d) : In case of a p-n junction diode, the change in temperature due to heating affects the entire V-I characteristics of the p-n junction diode. This is because heating increase the number of electron-hole pairs, which changes the overall resistance of the diode. This change in resistance affects both forward and reverse biasing, which in turn changes the overall V-I characteristics.

40. To determine the voltage regulation of synchronous generators, the direct load test is suitable only for alternators with power rating:

(a) less than 2 kVA

(b) less than 5 kVA

(c) less than 3 kVA

(d) more than 5 kVA

Ans. (b) : To determine the voltage regulation of synchronous generators, the direct load test is suitable only for alternators with power rating less than 5 kVA.

$$\text{Voltage regulation} = \frac{E_f - V_t}{V_t}$$

Where, V_t = Rated terminal voltage

E_f = No-load voltage

41. Which of the following is NOT correct with reference to full load testing of a single-phase transformer?

(a) This test is used to determine voltage regulation of the transformer.

(b) In Sumpner's test, two identical transformers are taken, in which primary windings are connected in parallel whereas secondary windings are connected in series but in phase opposition.

(c) This test is used to determine temperature rise and efficiency of the transformer.

(d) In Sumpner's test, two identical transformers are taken, in which primary windings are connected in parallel whereas secondary windings are connected in series.

Ans. (d) : Sumpner's test:

• This test is performed on a transformer to determine voltage regulation, temperature rise and efficiency of the transformer.

• In Sumpner's test, two identical transformers are taken, in which primary windings are connected in parallel whereas secondary windings are connected in series but in phase opposition.

• Therefore option (d) is not correct with reference to full load testing of a single phase transformer.

42. Two identical coils A and B have 400 turns placed such that 60% of flux produced by one coil links with the other. If a current of 10A flowing in coil A produces a flux of 20 mWb in it, find the mutual inductance between coil A and B.
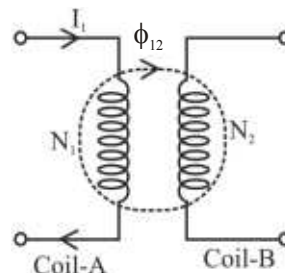
(a) 0.48 H

(b) 100 H

(c) 480 H

(d) 10 H

Ans. (a) : Given,

$N_1 = N_2 = 400$ turns

$I_1 = 10A$, $\phi_1 = 20mWb$,

$\phi_{12} = 20 \times 10^{-3} \times 0.6 = 12mWb$

Due to current I_1, the flux produced is ϕ_1 which links with both the coils.

Then the mutual inductance between two coils can be written as,

$$M = \frac{N_1 \phi_{12}}{I_1}$$

$$M = \frac{400 \times 12 \times 10^{-3}}{10}$$

$$\boxed{M = 0.48H}$$

43. Which of the following is a key indicator of good weld quality?
   (a) No crater cracking on the weld
   (b) The depth of weld penetration is minimal
   (c) The weld metal burns through the base material
   (d) A good weld should be non-uniform throughout its length

Ans. (a) : No crater cracking on the weld is a key indicator of good weld quality.

• For a good weld quality, there should be uniformity, proper fusion, smooth surface, no cracks, correct sizes and minimal distortion in the welded components.

44. The thermal efficiency of a steam plant is defined as ____.
   (a) The ratio of heat equivalent of mechanical energy transmitted to the turbine shaft to the heat of combustion of coal
   (b) The ratio of heat of combustion of coal to the heat equivalent of electrical output
   (c) The ratio of heat of combustion of coal to the heat equivalent of mechanical energy transmitted to the turbine shaft
   (d) The ratio of heat equivalent of electrical output to the heat of combustion of coal

Ans. (a) : The thermal efficiency of a steam plant is defined as the ratio of heat equivalent of mechanical energy transmitted to the turbine shaft to the heat of combustion of coal.

• The thermal efficiency of a modern steam power station is about 30%.

$$\eta_{thermal} = \frac{\text{Heat equivalent of mechanical energy transmitted to the turbine shaft}}{\text{Heat of combustion of coal.}}$$

45. In the measurement of RMS value of a voltage in CRO, the peak-to-peak voltage is divided by which of the following values?
   (a) $\dfrac{2}{\sqrt{2}}$
   (b) $2\sqrt{2}$
   (c) $\sqrt{2}$
   (d) $\dfrac{1}{\sqrt{2}}$

Ans. (b) : We know that, in the measurement of RMS value of a voltage in CRO,

$$V_{rms} = \frac{V_m}{\sqrt{2}}$$

$$V_{P-P} = 2V_m$$

$$\Rightarrow \quad V_{rms} = \frac{2V_m}{2\sqrt{2}} = \frac{V_{P-P}}{2\sqrt{2}}$$

$$\boxed{V_{rms} = \frac{V_{P-P}}{2\sqrt{2}}}$$

46. Damper winding in synchronous motors is used to _____.
   A) Prevent the effect of hunting
   B) Make synchronous motors self-starting
   C) Reduce the speed of synchronous motors
   D) Provide constant synchronous motor torque
   (a) B and C
   (b) C and D
   (c) A and B
   (d) A and D

Ans. (c) : Damper winding in synchronous motor is used to-
(i) Prevent the effect of hunting.
(ii) Make synchronous motor self starting.

47. The advantage of using soft starter for an induction motor is for protection against_____.
   (a) Only phase failure
   (b) Phase failure, overcurrent, and undercurrent
   (c) Only undercurrent
   (d) Only overcurrent

Ans. (b) : The advantage of using soft starter for an induction motor is for protection against phase failure, over current, and under current.

• A soft starter helps to limits the transient voltage and protects the motor against sudden power surges when the motor is in operation or there is a power outage.

48. Which of the following is NOT a method for solution of medium transmission line?
   (a) Nominal-T method
   (b) Nominal-π method
   (c) End condenser method
   (d) Nominal-H method

Ans. (d) : Methods for solution of medium transmission line:
(i) Nominal-T method
(ii) Nominal-π method
(iii) End-condenser method
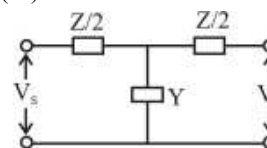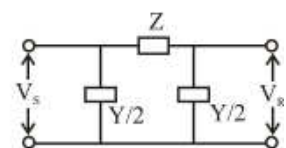
(I) Nominal-T model   (ii) Nominal-π Model

(iii) End-condenser model

Therefore nominal-H method is not a method for solution of medium transmission line.

49. **The value of unknown current in CRO is measured by:**
   (a) Ratio of voltage measured on CRO to resistance of the CRO
   (b) Ratio of voltage measured on CRO to standard resistance
   (c) Ratio of voltage measured across the unknown resistance to that unknown resistance itself
   (d) Ratio of voltage measured on CRO to resistance of Aquadag

Ans. (b) : The value of unknown current in CRO is measured by ratio of voltage measured on CRO to standard resistance.

Deflection sensitivity of CRO-

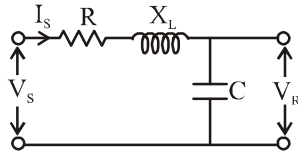● Electrostatic deflection (D) = $\dfrac{L\ell_d.E_d}{2dE_a}$

● Deflection sensitivity (S) = $\dfrac{D}{E_d} = \dfrac{L\ell_d}{2dE_a}(m/v)$

Where,
   $E_a \rightarrow$ Voltage of pre-accelerating anode
   $E_d \rightarrow$ Potential between deflecting plates (Volt)
   $L \rightarrow$ Distance between screen and the centre of the deflecting plates.
   $\ell_d \rightarrow$ Length of deflecting plate
   $d \rightarrow$ Distance between deflecting plate (in meter)

50. **Which of the following statements is correct for the radial distribution network's distributors load change?**
   (a) No consumer in the distribution network will be subjected with any voltage fluctuations.
   (b) The consumer situated at very close to the distributor will be subjected with serious voltage fluctuations.
   (c) The consumer situated at the distant end of the distributor will be subjected with serious voltage fluctuations.
   (d) The consumer situated at the middle of the distributor will be subjected with serious voltage fluctuations.

Ans. (c) : In a radial distribution network, the consumer situated at the distant end of the distributor will be subjected with serious voltage fluctuations.
● The system is used only when the substation is located at the center of the consumers. In this system, different feeders radiate from a substation and feed the distributors at one end.

51. **In the estimation and costing, utmost importance is given for the payment of suppliers in an agreed time in order to maintain _____.**
   (a) The guarantee
   (b) Deposit security
   (c) Flexibility
   (d) The contract

Ans. (c) : In the estimation and costing, utmost importance is given for the payment of suppliers in an agreed time in order to maintain flexibility.

52. **The average demand of a plant is 55 MW. Find the maximum energy that can be produced if the plant is running at full load according to the operating schedule. The plant use factor is 60%.**
   (a) 2200 MWh   (b) 792 MWh
   (c) 92 MWh   (d) 33 MWh

Ans. (a) : Given,
   Average demand = 55MW
   Plant use factor = 60% = 0.6
We know that,

   Plant use factor = $\dfrac{\text{Average demand}}{\text{Plant capacity}}$

   Plant capacity = $\dfrac{55}{0.6} = \dfrac{550}{6}$

∴   Maximum energy produced during a day
   $= \dfrac{550}{6} \times 24$
   $= 2200 \text{MWh}$

53. **In a single-phase induction motor core loss is neglected. The exciting branch is only consisting of:**
   (a) Load resistance
   (b) Load reactance
   (c) No load resistance
   (d) Exciting reactance

Ans. (d) : In a single-phase induction motor core loss is neglected. The exciting branch is only consisting of exciting reactance.
● In single phase induction motor, the exciting branch represents the magnetizing circuit, which is responsible for producing the magnetic field in the motor.

54. The speed-torque characteristics of which motor whose speed falls when there is increase in load torque is suitable to the application?
(a) DC differential compound motor
(b) DC series motor
(c) DC shunt motor
(d) DC compound motor

Ans. (b) : The speed torque characteristics of a DC series motor are suitable for applications where the speed should fall when there is increase in load torque.
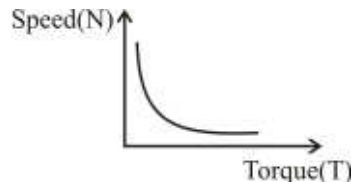
Speed-torque characteristics.

55. Which of the following conditions is favourable for the application of radial distribution network?
(a) Power is generated at low voltage and substation is located very far away from load centre
(b) Power is generated at high voltage and substation is located very far away from the load centre
(c) Power is generated at low voltage and substation is located at the load centre
(d) Power is generated at high voltage and substation is located at the load centre

Ans. (c) : Radial distribution networks are favourable when:
- Power is generated at low voltage.
- The substation is located close to the load center (The area where the majority of the consumers are located).
- Radial distribution system is the simplest system and has the lowest initial cost but it is not highly reliable.

56. In stator resistance starter, if applied voltage across motor terminals is reduced by 50%, then torque is reduced to _____ of the full voltage value.
(a) 25%   (b) 75%
(c) 50%   (d) 12.5%

Ans. (a) : In an induction motor torque is proportional to the square of the applied voltage.
$$T \propto V^2$$
$$T = KV^2 \quad \text{(At full voltage)}$$
$$T' = K \times (0.5V)^2$$
$$T' = K \times (0.25V^2)$$

Hence torque is reduced to 25% of the full load torque, if applied voltage across motor terminals is reduced by 50%.

57. As per the principles of estimation and costing, if the quantity of materials required for work is not ready, then the minimum order quantity required shall be requested in the ____.
(a) purchase order
(b) purchase enquiry
(c) comparative statement
(d) tender enquiry

Ans. (d) : As per the principles of estimation and costing, if the quantity of materials required for work is not ready, then the minimum order quantity required shall be requested in the tender enquiry.

58. Which of the following materials is most commonly used for the filaments in incandescent lamps?
(a) Tungsten
(b) Gold
(c) Aluminium
(d) Iron

Ans. (a) : Tungsten is most commonly used for the filaments in incandescent lamps.
- It has high melting point and retains its strength when heated.

59. The starting torque of a slip ring induction motor is maximum when rotor resistance/phase is _____ rotor reactance/phase.
(a) equal to   (b) not equal to
(c) more than   (d) less than

Ans. (a) : The starting torque of a slip ring induction motor is maximum when rotor resistance per phase is equal to rotor reactance per phase.

Torque equation of 3-ϕ induction motor:
$$T = \frac{KsE_2^2 R_2}{\left(R_2\right)^2 + (sX_2)^2}$$

Maximum torque condition:
$$s_m = \frac{R_2}{X_2}$$

Condition of maximum torque at starting:
$$\boxed{R_2 = X_2}$$

60. If Δ is the phase angle between supply voltage and pressure coil flux, which of the following statements is correct about the adjustable resistance used in the energy meter?
(a) It has very low resistance to adjust Δ to 0°.
(b) It has very low resistance to adjust Δ to 90°.
(c) It has very high resistance to adjust Δ to 90°.
(d) It has very high resistance to adjust Δ to 0°.

Ans. (b) : In an energy meter the adjustable resistance is used to adjust the phase angle Δ between the supply voltage and the pressure coil flux to 90º. This is done to ensure accurate measurement of energy consumption.

By having a very low resistance in the adjustable resistance the phase angle Δ can be adjusted to 90º, which is the ideal operating condition for the energy meter.

61. In a metal oxide semiconductor FET, the metal oxide layer acts as a/an _____.
- (a) Dielectric
- (b) Capacitor
- (c) Gate
- (d) Electric field

Ans. (a) : In a metal oxide semiconductor FET, The metal oxide layer acts as a dielectric.

Property of MOSFET-
- Very high input impedance.
- Very high switching frequency.
- It is used as a voltage controlled capacitor.
- It is also known as IGFET.

62. A 400V, 3-phase, star-connected synchronous motor has armature current of 200A at effective resistance of 0.04 Ohms. The short-circuit load loss at half-full load is _____.
- (a) 1000W
- (b) 2000W
- (c) 1200W
- (d) 2100W

Ans. (c) : Given,

$R = 0.04\Omega$, $I_a = 200A$

$V = 400$Volt

$\therefore$ The short circuit loss at half of full load $= 3\left(\dfrac{I_a}{2}\right)^2 .R$

$= 3\times\left(\dfrac{200}{2}\right)^2 \times 0.04$

$= 3\times10^4\times 0.04$

$= 1200W$

63. The connections of three-phase energy metre for measuring three-phase power, three wire energy is similar to the connections of _____.
- (a) Two wattmeter for voltage measurement
- (b) Three wattmeter for voltage measurement
- (c) Three wattmeter for power measurement
- (d) Two wattmeter for power measurement

Ans. (d) : The connections of three-phase energy metre for measuring three-phase power, three wire energy is similar to the connections of two wattmeter for power measurement.

- 3-ϕ Active power $= \sqrt{3}V_L I_L \cos\phi$
- 3-ϕ Reactive power $= \sqrt{3}V_L I_L \sin\phi$

Required wattmeter for measurement of power-
- For n-phase n-wire system→ (n-1) wattmeter requires (Balance/unbalance)
- For n-phase (n+1)-wire system→n wattmeter requires (unbalance)
- For n-phase (n+1)-wire balance system→1 wattmeter require.

64. In regard to estimation and costing, the accurate estimate in which the quantity of each item of work is calculated is called _____.
- (a) rough estimate
- (b) detailed estimate
- (c) supplementary estimate
- (d) approximate estimate

Ans. (b) : In regard to estimation and costing, the accurate estimate in which the quantity of each item of work is calculated is called detailed estimate.

65. A particular consumer has loads of 200 kW, 400 kW and 300 kW, which are operating continuously. If the maximum demand of the consumer is 600 kW, find the demand factor of the system.
- (a) 66.67%
- (b) 16.67%
- (c) 42.5%
- (d) 33.33%

Ans. (a) : Given,

Maximum demand = 600kW

Total connected loads = 200 + 400 + 300 = 900kW

We know that,

$\text{Demand Factor} = \dfrac{\text{Maximum demand}}{\text{Connected load}} \times 100$

$= \dfrac{600}{900} \times 100$

$= 66.67\%$

66. A single phase transmission line is transmitting 1,100 kW power at 11 kV and at unity power factor. If it has a total resistance of 5 Ω, what is the efficiency of the transmission line?
- (a) 100%
- (b) 99.54%
- (c) 80.96%
- (d) 89.65%

Ans. (b) : Given,

$P = 1100$kW

$V = 11$kV, $R = 5\Omega$, $\cos\phi = 1$

$\eta = ?$

We know that,

$P = VI \cos\phi \qquad [\because \cos\phi = 1]$

$I = \dfrac{P}{V}$

$I = \dfrac{1100\times10^3}{11\times10^3} = 100A$

Losses $= I^2R = (100)^2 \times 5 = 50kW$

Received power = transmitted power − losses

$\qquad = 1100\ kW - 50kW$

$\qquad = 1050\ kW$

Efficiency $(\eta) = \dfrac{\text{Received power}}{\text{Transmitted power}} \times 100$

$\qquad = \dfrac{1050}{1100} \times 100$

$\qquad \eta = 95.45\%$

$\qquad \eta \simeq 99.54\%$

67. In a semiconductor diode, the ratio of change in the forward biased voltage across the diode to change in the current in the diode is called ____.
   (a) AC reverse resistance
   (b) AC forward resistance
   (c) DC reverse resistance
   (d) DC forward resistance

Ans. (b) : In a semiconductor diode, the ratio of change in the forward biased voltage across the diode to change in the current in the diode is called AC forward resistance.

68. Which of the following statements is true regarding the setting of an earth fault relay?
   (a) The setting should always be less than the rated full-load current of the line.
   (b) The setting should always be greater than the rated full-load current of the line.
   (c) The setting does not depend upon the rated full-load current of the line.
   (d) The setting should always be equal to the rated full-load current of the line.

Ans. (a) : When setting of an earth fault relay, the goal is to detect earth faults while avoiding unnecessary tripping due to normal load currents. To achieve this, the relay setting should always be less than the rated full-load current of the line. This ensures that the relay will operate in case of a genuine earth fault, and not during normal operation.

69. Power measured using 2 wattmeter method from a three-phase balanced/unbalanced load where line voltage = V_L, Line current = I_L, Phase voltage = V_P and Phase current = I_P is given by:
   (a) $\sqrt{3}V_L I_L \cos\phi$
   (b) $\sqrt{3}V_P I_P \cos\phi$
   (c) $\sqrt{3}V_P I_P \sin\phi$
   (d) $3V_L I_L \cos\phi$

Ans. (a) : Power measured using 2-wattmeter method from a three-phase balanced/unbalanced load where line voltage = V_L, line current = I_L, phase voltage = V_P and phase current = I_P is given by:

$$\boxed{P = \sqrt{3}V_L I_L \cos\phi}$$
or
$$\boxed{P = 3V_P I_P \cos\phi}$$

70. In electric power, if a body makes N rpm and the torque acting is T newton-meter, then work done per minute will be _____.
   (a) mgh joules
   (b) $2\pi NT$ joules
   (c) m×g joules
   (d) $(2\pi NT)/60$ joules

Ans. (b) : We know that,

$$\text{Power} = \frac{\text{Work done}}{\text{Time}}, \text{ in Joule/sec or watts}$$

$[P = \omega \times T]$, Where T = Torque, ω = Angular velocity

$$P = \frac{2\pi N}{60} \times T \text{ Joule/sec}$$

$$P = \frac{2\pi N}{60} \times T \times 60 \text{ Joule/minute}$$

$$\boxed{P = 2\pi NT \text{ Joule/minute}}$$

71. Which of the following plays a vital role in the determination of sending end and receiving end voltage in ring main AC distribution scheme?
   (a) Hysteresis loss
   (b) Eddy current loss
   (c) Breakdown voltage of a distribution transformeroil
   (d) Power factor

Ans. (d) : Power factor plays a vital role in the determination of sending end and receiving end voltage in ring main AC distribution scheme.

72. Which of the following factors is NOT related to the reluctance of the magnetic circuit?
   (a) Magnetomotive force
   (b) Length of the magnetic circuit
   (c) Nature of the magnetic material
   (d) Area of the cross-section of the circuit

Ans. (a) : Reluctance is the property of a magnetic circuit of opposing the passage of magnetic flux lines.
• The reluctance of magnetic circuit depends on length, area and nature of magnetic material.

$$\boxed{\text{Reluctance}(S) = \frac{\ell}{\mu_0 \mu_r A}} \text{ Amp − turns/Weber}$$

73. The energy consumed by a 5Ω resistor carrying a 20A current in 10 minutes will be ____.

   (a) 120 KJ   (b) 1200 KJ

   (c) 2000 J   (d) 120 J

Ans. (b) : Given,

       $R = 5Ω, \quad I = 20A$

       $t = 10$ minutes $= 10 \times 60 = 600$ seconds

So, The energy consumed by 5Ω resistor,

       $H = I^2Rt$

       $H = (20)^2 \times 5 \times 600$

       $\boxed{H = 1200KJ}$

74. Which of the following types of cooling is employed in small and medium distribution transformers?

   (a) Water filled oil cooled

   (b) Water filled self-cooled

   (c) Oil filled self-cooled

   (d) Oil filled water cooled

Ans. (c) : Oil filled self-cooled type cooling is employed in small and medium distribution transformers.

Transformer cooling methods-

1. For dry type transformer

(i) Air natural cooling → Upto 5 kVA

(ii) Air Blast cooling → Upto 25kVA

2. For oil immersed transformer

(i) Oil Natural Air Natural (ONAN) Cooling- Upto 10 MVA

(ii) Oil Natural Air Forced (ONAF) Cooling- Upto 30 MVA

75. A 415 V, 3-phase voltage is applied to a balanced star connected purely resistive load of 10 Ω. What is the ratio of reactive power to active power?

   (a) 100   (b) Infinity

   (c) 1   (d) 0

Ans. (d) : Given,

       $V_L = 415$Volt

       $R = 10Ω$

For resistive load, the power factor (cos ϕ)=1

Active power (P) = $3V_PI_P \cos\phi$

       ⇒ $P = 3V_PI_P$

Reactive power (Q) = $3V_PI_P\sin\phi$

       ⇒ $Q = 3V_PI_P \times 0$ [∵ cos ϕ = 1 ⇒ sinϕ = 0]

       ⇒ $Q = 0$

So,

       $\boxed{\dfrac{Q}{P} = \dfrac{0}{3V_PI_P} = 0}$

76. In any electric circuit, if i_1 and i_3 are incoming currents and i_2 and i_4 are outgoing currents from a node, then according to KCL which is the correct answer?

   (a) $i_1 - i_2 = i_3 - i_4$

   (b) $i_1 + i_3 = i_2 + i_4$

   (c) $i_1 + i_2 = i_3 + i_4$

   (d) $i_4 - i_1 = i_2 + i_3$

Ans. (b) : According to Kirchhoff's current law (KCL) at a node sum of incoming currents is equal to the sum of outgoing currents.

Hence,

       $\boxed{i_1 + i_3 = i_2 + i_4}$

77. Select the correct statement regarding coal-fired boilers.

   (a) Water-tube boilers are more efficient than fire-tube boilers.

   (b) Fire-tube boilers are typically used for high-pressure applications.

   (c) Water-tube boilers are less expensive compared to fire-tube boilers.

   (d) Fire-tube boilers have higher thermal efficiency compared to water-tube boilers.

Ans. (a) : The correct statement regarding coal-fired boilers is that water-tube boilers are more efficient than fire-tube boilers. Because they have a large heating surface and can handle high pressures and temperatures. This makes them more suitable for high-efficiency applications such as power generation.

78. The current amplification factor for a transistor in a common base configuration is 0.75. If the emitter current is 4A, find the base current.

   (a) 1 A   (b) 0 A

   (c) 3 A   (d) 5 A

Ans. (a) : Given,

       $\alpha = 0.75, I_E = 4A, I_B = ?$

We know that,

       $\alpha = \dfrac{I_C}{I_E} \Rightarrow I_C = \alpha I_E$

              ⇒ $I_C = 0.75 \times 4 = 3A$

∵ $I_E = I_C + I_B$

⇒ $I_B = I_E - I_C = 4 - 3 = 1A$

⇒ $\boxed{I_B = 1A}$

79. What is the purpose of a maximum power point tracker (MPPT) in a PV system?

   (a) To reduce the power losses within the PV cells

   (b) To increase the open circuit voltage (Voc) of the PV cells

(c) To maximise the electrical power output of the PV system

(d) To convert DC current to AC current

Ans. (c) : The purpose of a maximum power point tracker (MPPT) in a PV system is to maximise the electrical power output of the PV system.

● MPPT is a technology used in solar power systems to maximize the efficiency of PV panels.

● MPPT systems adjust the operating point of the solar panels to ensure they operate at maximum power output, even with changing sunlight intensity and temperature conditions.

80. In an electrostatic instrument, the controlling torque can be adjusted by:

 I. Changing the spring constant
 II. Changing the length of the pointer needle
 III. Changing the distance between the plates
 IV. Changing the position of the instrument

(a) Only I and III   (b) Only I and IV

(c) Only III and IV   (d) Only I and II

Ans. (a) : Electrostatic instrument:

Deflecting torque $(T_d) = \dfrac{1}{2}V^2\dfrac{dC}{d\theta}$

Controlling torque $(T_C) = K\theta$

At equilibrium, $T_d = T_C \Rightarrow \theta = \dfrac{1}{2K}V^2\dfrac{dC}{d\theta}$

Therefore in electrostatic instrument, the controlling torque can be adjusted by:

(i) Changing the spring constant.

(ii) Changing the distance between the plates.
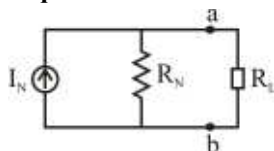
Hence, only I and III is correct.

81. If two identical 2A, 2Ω Norton equivalent circuits are connected in parallel with like polarity connected to like polarity, the combined Norton equivalent circuit is:

(a) 0 A, 1 Ω   (b) 4 A, 1 Ω

(c) 4 A, 4 Ω   (d) 2 A, 4 Ω

Ans. (b) : Given,
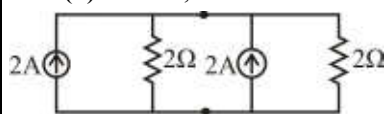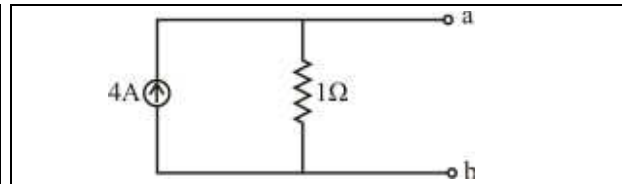

Norton's equivalent circuit:

So,

Current gets added hence, $I_N = 2+2 = 4A$

$R_N = (2\|2) = 1\Omega$

∴   Overall Norton's equivalent circuit is-

82. The built-in potential of a p-n junction ____.

(a) depends on doping concentration only

(b) depends on temperature only

(c) does not depend on temperature and doping concentration

(d) depends on both temperature and doping concentration

Ans. (d) : The built-in potential of a p-n junction depends on both temperature and doping concentration.

Built-in potential or contact potential (V_{bi}):

$$V_{bi} = \dfrac{KT}{q}\ell n\left[\dfrac{N_A N_D}{n_i^2}\right]$$

Where,

 V_{bi} = Built-in potential

 K = Boltzman's constant (1.38×10^{-23} J/K)

 q = Electron charge (1.6×10^{-19} C)

 T = Temperature in Kelvin

 N_A = Concentration of accepters on p-side

 N_D = Concentration of donor on n-side

 n_i = Intrinsic concentration at given temperature.

83. Calculate the inductance of an air core solenoid of length 400 cm, area of cross-section $\left(\dfrac{2}{\pi}\right)$ m² and having 200 turns.

(a) 8 H   (b) 8 mH

(c) 10 H   (d) 0.08 H

Ans. (b) : Given,

 $\ell = 400$ cm = 4m

 $A = \left(\dfrac{2}{\pi}\right)$ m², n = 200 turns

The inductance of solenoid is,

$$L = \dfrac{N\phi}{I} = \dfrac{N(BA)}{I} = \dfrac{\mu_0\mu_r N^2 A}{\ell}$$

$\Rightarrow \quad L = \dfrac{\mu_0 N^2 A}{\ell}$ (∵ for air $\mu_r = 1$)

$\Rightarrow \quad L = \dfrac{4\pi \times 10^{-7} \times (200)^2 \times \dfrac{2}{\pi}}{4}$

$\Rightarrow \quad L = 8 \times 10^{-3}$ H

$\Rightarrow \quad \boxed{L = 8mH}$

84. Back EMF is a significant quantity during operation of a DC motor. Which of the following statements regarding the concept of Back EMF is correct?
  (a) Back EMF is not necessary for the electromechanical energy conversion in a motor.
  (b) At no load, the back EMF is zero.
  (c) The back EMF decreases considerably while loading the motor.
  (d) Back EMF increases considerably while loading the motor.

Ans. (c) : Back emf is a significant quantity during operation of a DC motor. The correct statement regarding back emf is, the back EMF decreases considerably while loading the motor, because the speed of motor decreases.

$$\text{Back emf}\left(E_b\right) = \frac{P\phi NZ}{60A}$$

$$\boxed{E_b \propto N}$$

85. Lissajous patterns on a CRO has ten vertical maximum values and eight horizontal maximum values. The frequency of the horizontal input is 1000 Hz. Determine the frequency of the vertical input?
  (a) 1256 Hz   (b) 1344 Hz
  (c) 1000 Hz   (d) 800 Hz

Ans. (d) : Given,
Frequency of horizontal input (f_H) = 1000Hz
Vertical tangencies (N_V) = 10
Horizontal tangencies (N_H) = 8
Frequency of vertical input (f_V) = ?
We know that,

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

$$\Rightarrow \quad f_V = f_H \times \frac{N_H}{N_V} = 1000 \times \frac{8}{10} = 800Hz$$

$$\boxed{f_V = 800Hz}$$

86. In an electrical circuit, the sum of EMFs of all the sources met on the way plus the voltage drops in the resistances must be zero. This can be explained by ____.
  (a) Ohm's law
  (b) Laplace's law
  (c) Kirchhoff's voltage law
  (d) Kirchhoff's current law

Ans. (c) : In an electrical circuit, the sum of EMFs of all the sources met on the way plus the voltage drops in the resistances must be zero. This can be explained by Kirchhoff's voltage law.

87. Rotor current frequency = Fractional slip × _____.
  (a) No. of poles
  (b) Supply frequency
  (c) Rotor speed
  (d) EMF

Ans. (b) : We know that,
Rotor current frequency (f_r)
$\qquad$ = Fractional slip (s) ×supply frequency (f)
$$\Rightarrow \boxed{f_r = sf}$$

88. The consumer associated with the ring main distribution scheme experiences _____ as compared to the radial distribution scheme.
  (a) less reliable power supply
  (b) no copper loss
  (c) less voltage fluctuations
  (d) unity power factor always

Ans. (c) : The consumer associated with the ring main distribution scheme experiences less voltage fluctuations as compared to the radial distribution scheme.
• Ring main system is very reliable as each distribution transformer is fed with two feeders. That means, in the event of a fault in any section of the feeder, the continuity of the supply is ensured from the alternative path.

89. How is the resistance of a wire related to the length of the wire?
  (a) Not related
  (b) Directly proportional
  (c) Proportional to square of length
  (d) Inversely proportional

Ans. (b) : The resistance of a wire is directly proportional to the length of the wire.

Resistance (R) = $\boxed{\dfrac{\rho\ell}{A}\text{ohm}}$

Where,
$\qquad$ R = Resistance of the wire
$\qquad$ ℓ = Length of the wire
$\qquad$ ρ = Resistivity
$\qquad$ A = cross-sectional area

90. In an induction motor, the relationship between gross mechanical power developed and rotor input is _____.
  (a) Gross mechanical power developed = (1/s) × Rotor input
  (b) Gross mechanical power developed = (2−s) × Rotor input
  (c) Gross mechanical power developed = s × Rotor input
  (d) Gross mechanical power developed = (1−s) × Rotor input

Ans. (d) : In an induction motor, the relationship between gross mechanical power developed and rotor input is given as:

Gross mechanical power developed = (1-s)×Rotor input

$$P_g : P_{cu} : P_{md} = 1 : s : (1-s)$$

- Rotor ohmic loss (P_{cu}) = sP_g
- Per phase power input to rotor = P_g
- $P_{md} = (1-s)P_g$

91. An induction motor can be treated as a transformer with _____.
   (a) short circuited secondary winding
   (b) open circuited primary winding
   (c) open circuited secondary winding
   (d) short circuited primary winding

Ans. (a) : An Induction motor can be treated as a transformer with short circuited secondary winding. Because of the similarities between the operation of an induction motor and a transformer with a short circuited secondary winding.

92. In a parallel circuit, if 'n' resistors, each of 'R' Ω, are connected in parallel, then the total resistance is equal to _____.
   (a) R/n   (b) R×n
   (c) R+n   (d) (R²)/n

Ans. (a) : When 'n' resistors, each of 'R' ohm are connected in parallel, then the total resistance,

$$\Rightarrow \quad R_{eq} = \frac{R}{n} \Omega$$

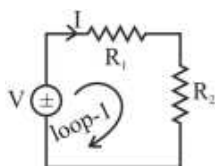■ When 'n' resistors, each of 'R' ohm are connected in series, then the total resistance,

$$R_{eq} = nR \ \Omega$$

93. An electrical network contains only one loop and no other mesh. How many KVL equations can be formed for the circuit?
   (a) 4   (b) 1
   (c) 3   (d) 2

Ans. (b) : An electrical network contains only one loop and no other mesh, then only one KVL equations can be formed for the circuit.
Example:

$V = IR_1 + IR_2$
Here only one KVL equation can be formed

94. Which of the following are the significance of good welds?
   I) Good welds provide strong and reliable bonds between metal components.
   II) High-quality welds require the need for rework, repairs, etc.
   III) They assist fatigue, corrosion and wear contributing to reduce the longevity of the structures.
   IV) Good welds not only provide functional benefits but also contribute to the aesthetics of finished products.
   (a) I and III
   (b) I and IV
   (c) II and IV
   (d) II and III

Ans. (b) : Following are the significance of good welds:
(i) Good welds provide strong and reliable bonds between metal components.
(ii) High quality welds do not require the need for rework, repairs, etc.
(iii) They do not assist fatigue, corrosion and wear contributing to reduce the longevity of the structures.
(iv) Good welds not only provide functional benefits but also contribute to the aesthetics of finished products.

95. What is the significance of having hot reserve capacity in a power system?
   (a) To ensure power system stability and reliability during emergencies or unexpected events.
   (b) To meet sudden fluctuations in electricity demand and maintain grid balance
   (c) To provide backup power in case of a complete power outage.
   (d) To act as a secondary power source during peak demand periods.

Ans. (b) : The significance of having hot reserve capacity in a power system to ensure power system stability and reliability during emergencies or unexpected events.
- Hot reserve is defined as a reserve generating capacity which is not in service but is in operation.
- Cold reserve is the generating capacity which is available for service but not normally ready for immediate loading.

96. What is the diversity factor in a power system?
   (a) The ratio of the sum of individual maximum demands of all consumers to the maximum demand of the power station
   (b) The ratio of maximum demand of the power station to the sum of individual maximum demands of all consumers connected to it

(c) The ratio of the maximum demand of the power station to the sum of average demands of all consumers connected to it

(d) The ratio of the maximum demand of the power station to the sum of individual minimum demands of all consumers

Ans. (a) : Diversity factor in a power system is the ratio of the sum of individual maximum demands of all consumers to the maximum demand of the power station.

Diversity factor

$$= \frac{\text{Sum of individual maximum demands}}{\text{Maximum demand of power station}}$$

$$D.F > 1$$

97. Shaded-pole induction motors have which of the following properties?

(a) Very high starting torque

(b) Low starting torque

(c) Medium starting torque

(d) High starting torque

Ans. (b) : Shaded-pole induction motors have low starting torque.

- Shaded-pole induction motor is usually low in efficiency, and built around 1/20 to 1/2 hp.

98. A 3-phase voltage of 220 V is applied to a balanced, delta-connected, 3-phase, purely resistive load. Calculate the ratio of the reactive power to the active power.

(a) 0   (b) 2

(c) 1   (d) 0.5

Ans. (a) : We know that, for purely resistive load the power factor $(\cos\phi) = 1$

$\Rightarrow \sin\phi = 0$

$\because$ Active power, $P = 3V_P I_P \cos\phi$

$\qquad P = 3V_P I_P$

and reactive power, $Q = 3V_P I_P \sin\phi$

$\qquad Q = 3V_P I_P \times 0 \qquad [\because \cos\phi = 1 \Rightarrow \sin\phi = 0]$

$\qquad Q = 0$

Hence,

$$\frac{Q}{P} = \frac{0}{3V_P I_P} = 0$$

$$\boxed{\frac{Q}{P} = 0}$$

99. If the field winding, armature winding are connected in parallel and the combination is connected in parallel with the supply, then this is called a _____.

(a) long shunt compound motor

(b) short shunt compound motor

(c) series motor

(d) shunt motor

Ans. (d) : If the field winding, armature winding are connected in parallel and the combination is connected in parallel with the supply, then this is called a shunt motor.

DC shunt motor-
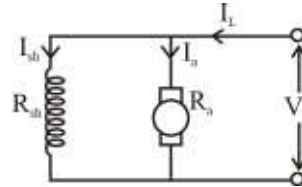
$$V_t = E_b + I_a R_a = I_{sh} R_{sh}$$

$$I_a = \frac{V_t - E_b}{R_a}$$

● Speed of shunt motor is fairly constant.

● It requires medium starting torque.

Application of DC shunt motor-

➤ Lathe machines

➤ Blowers and fans

➤ Milling machines

➤ Drilling machines

➤ Machine tools

➤ Centrifugal and reciprocating pumps.

100. Which of the following statements about equivalent circuit with core losses of single-phase motor is/are true?

1. The current drawn by the induction motor when it is not coupled to the driven equipment is called no load current of the motor.

2. The no load current produces the magnetic field in the motor.

(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. (d) : Statement-1: The current drawn by the induction motor when it is not coupled to the driven equipment is called no load current of the motor.

Statement-2: The no-load current produces the magnetic field in the motor.

Hence both statements (1) and (2) are true about equivalent circuit with core losses of single phase motor.