

IC-12

Serial No:

42075

ICEI-2012

(Read the Instructions carefully)

Time:03 Hours

Max. Marks: 150

Roll No.

Name of the Candidate: _____
(in capital letters)

Name of the Centre

Signature of the Candidate

Instructions

1. Fill up the information above by Pen/Ball Point Pen (Black or Blue).
2. The answer sheet is placed inside the test booklet. Without breaking the seal of the Test Booklet, take the Answer Sheet out. Don't break open the seal until you are asked to do so.
3. There are 150 questions. Each correct answer gets a score of one mark. There is no negative marking.
4. Each question is followed by four answers. You should select one answer from A, B, C or D considered by you as the most appropriate or correct answer and write that alphabet (in capital) on the Answer Sheet in ink in the box opposite the question number.
5. Do your rough work only on the blank pages provided at the end of the question booklet.
6. Uses of mobile phone, calculators, calculator-watch, slide rules, mathematical table, etc. are not allowed.
7. Make sure that you do not possess any pages (Blank or Printed) or any unauthorized material. If such material is found in your possession during the examination, you will be disqualified from entrance examination.
8. If you are found copying/helping others you will be disqualified from entrance examination.
9. Do not leave examination hall until you have recorded your attendance and submit the Answer Sheet to the Invigilator.
10. You are not allowed to leave the examination hall till the end of the entrance exam.
11. Ensure that there are 36 pages in this Test Booklet (including front and back page).
12. At the end of examination, candidate may be permitted to take the question booklet.

P.T.O.

1. Choose the correct alternative to fill the blank in the following sentence:
This generation needs good _____ T.V. programmes.
- A. educating
 - B. educative
 - C. educational
 - D. educated
2. Which of the following words have not been formed by attaching the prefix 'dis-' to a root word?
- A. disillusioned
 - B. disagreement
 - C. disgraceful
 - D. educational
3. The synonym of 'dexterous' is:
- A. Skillful
 - B. Clumsy
 - C. Diligent
 - D. Diplomatic
4. The synonym of 'innovation' is:
- A. Invention
 - B. Discovery
 - C. Renovation
 - D. Novelty
5. In which of the following sentences has the word 'like' (or a form of it) been used as an adjective?
- A. Children *like* sweets.
 - B. The two men are of *like* built.
 - C. Do not talk *like* that.
 - D. We shall not see the *likes* of him again.
6. Which of the following alternatives, would make the given sentence grammatically incorrect?
Such mistakes should seldom be made.
- A. not
 - B. seldom or never
 - C. seldom if ever
 - D. seldom or ever

Q. 7. In some poems, the same line (or a part of it) is repeated at the end (or the beginning) of each verse. This poetic device is called:

- A. Alliteration
- B. Refrain
- C. Imagery
- D. None of the above

Q. 8. In the sentence, 'Reading is his favourite pastime.', the word 'reading' is a(n):

- A. Gerund
- B. Verb
- C. Adjective
- D. Noun

Q. 9. What is the figure of speech used in 'To err is human; to forgive, divine.' And 'Man proposes, God disposes.'?

- A. Synecdoche
- B. Personification
- C. Metaphor
- D. Antithesis

Q. 10. Name the mood of the underlined verb: I wish I knew his name!

- A. Imperative
- B. Indicative
- C. Interrogative
- D. Subjunctive

Directions (Q. 11-15): Read the following passage carefully and answer the questions given below it.

During Emperor Akbar's reign, there was a poor man in Agra who was thought to bring bad luck. People believed that if any one looked at his face in the morning, they would have a bad day.

"Get lost, you ugly fellow!" he would be cursed by one and all. "Hide your face before you kill someone with your evil eye!" The emperor soon heard of this man's reputation and wanted to see him. The poor fellow, who had not harmed a single person in his life, was brought to Akbar. Akbar took a look at him and asked him to be brought back in evening. That particular day was an especially full and tiring day for the emperor and his courtiers. So many matters had to be attended to, that Akbar even forgot to eat. By the end of the day, the emperor was exhausted. To make matters worse, Akbar was informed that his favorite child, little Prince Salim, had fallen ill. Then the emperor suddenly remembered that he had seen the face of the 'unlucky' man that morning. That was it. It was that man's entire fault, Akbar

decided. Akbar called his courtiers and told them that he was going to have the 'unlucky' man executed. All of them agreed immediately. That is, all except Birbal. Instead, Birbal let out a short laugh. "What's the matter, Birbal?" asked the angry emperor. "You seem to find something funny!" "Nothing, Your Majesty," replied Birbal. "You say this man brings bad luck because you had to go without food ever since you saw him this morning. Look at his luck. Yours was the first face he saw today, and he has to die because of it." Akbar immediately realised his folly and rewarded Birbal for his wisdom.

~~Q~~ 11. Why had the King not eaten his food?

- A. He was very busy that day
- B. He had seen the face of the unlucky fellow
- C. He was not feeling well
- D. He had been invited by Birbal for lunch

~~Q~~ 12. Who was not well on that particular day?

- A. King Akbar
- B. The King's courtiers
- C. Birbal
- D. Prince Salim

~~Q~~ 13. Which of the following describe Birbal?

- A. He was a famous merchant
- B. He had lost his senses
- C. He was very poor
- D. He possessed good logical thinking

~~Q~~ 14. Which of the following is TRUE in the context of the passage?

- A. The poor man wanted to see the king.
- B. The poor man was well educated.
- C. The courtiers were sympathetic with the poor man
- D. King Akbar realised his mistake

~~Q~~ 15. Which of the following is/are NOT TRUE in the context of the passage?

- (1) Akbar worried too much after meeting the poor man.
- (2) Akbar had eaten his food with the poor man.
- (3) Akbar decided to execute the poor man.

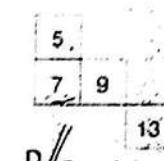
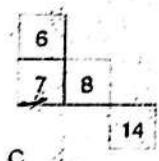
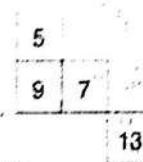
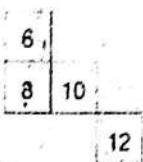
- A. Only (1)
- B. Both (1) and (3)
- C. All (1), (2) and (3)
- D. Only (3)

*Khud dikhlo
Ajeeb hai*

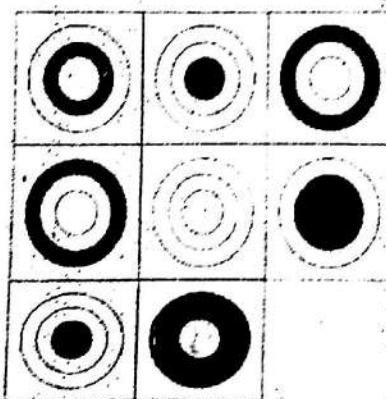
Q16.

1	2	4	7
4	?	7	10
6	?	?	12
7	8	10	?

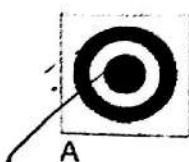
Which is the missing section?



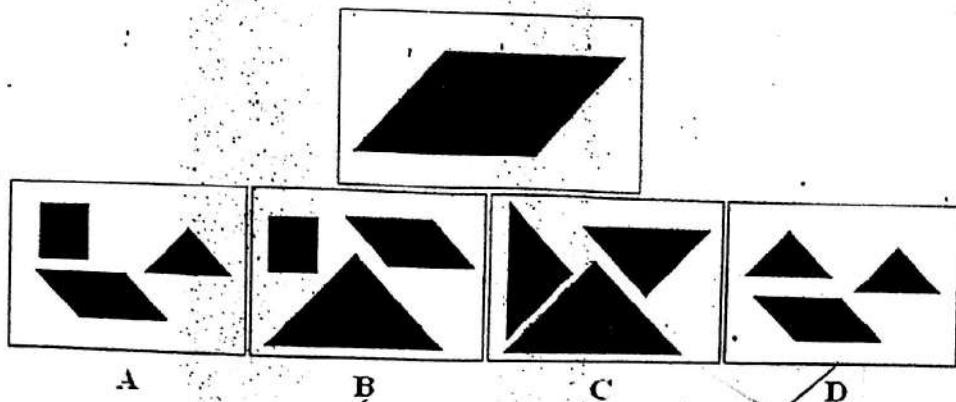
Q17.



Which is the missing tile?



Q 18. Which group of shapes can be assembled to make the shape shown?



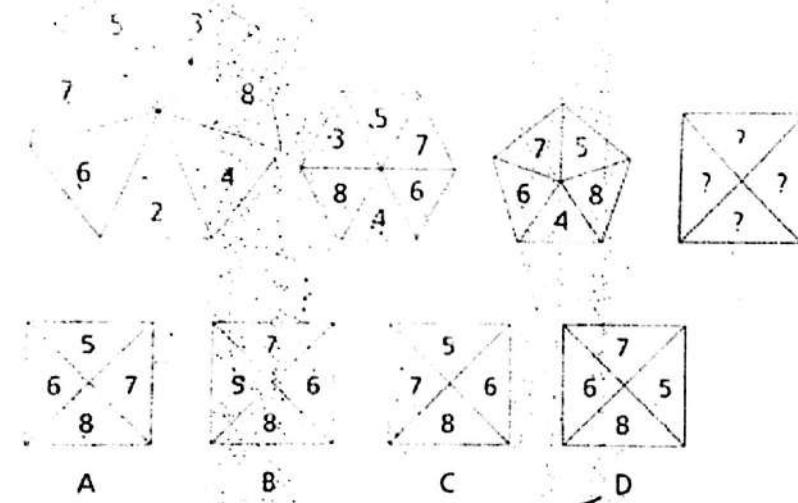
A

B

C

D

Q 19. Which box of numbers (A, B, C or D) should replace the box of question marks?



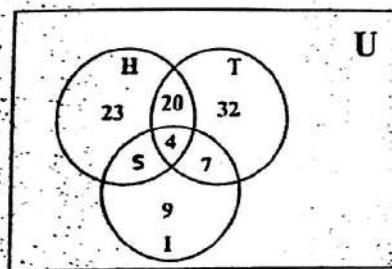
A

B

C

D

Directions (Q.20-24): The Venn diagram below represents the readership of Hindustan Times (H), The Times of India (T) and Indian Express (I) in a locality of Delhi.



$$\begin{array}{r}
 23 \\
 32 \\
 20 \\
 \hline
 75
 \end{array}$$

$$\begin{array}{r}
 23 \\
 20 \\
 4 \\
 32 \\
 7 \\
 \hline
 86
 \end{array}$$

$$\begin{array}{r}
 23 \\
 29 \\
 \hline
 52
 \end{array}$$

Q.20. How many read *Hindustan Times*?

- A. 47
- B. 51
- C. 9
- D. 29

Q.21. How many read *Hindustan Times* but not *The Times of India*?

- A. 24
- B. 28
- C. 16
- D. 37

Q.22. How many read *Hindustan Times* or *The Times of India*?

- A. 85
- B. 68
- C. 90
- D. 72

Q.23. How many read *Hindustan Times* and *The Times of India*?

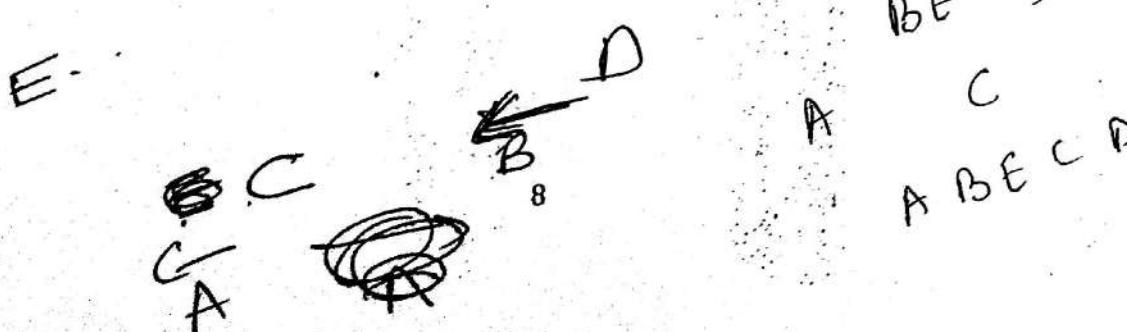
- A. 24
- B. 28
- C. 16
- D. 37

Q.24. How many read *Hindustan Times* and *The Times of India* but not *Indian Express*?

- A. 24
- B. 28
- C. 20
- D. 18

Directions (Q.25-27): Five educational films A, B, C, D, & E are to be shown to a group of students. The films are to be shown in a particular order, which conforms to the following conditions:

- A must be shown earlier than C.
- B must be shown earlier than D.
- E should be the third film shown.



Q 25. Which among the following is an acceptable order for showing the educational films?

- A. A, C, B, D, E
- B. A, C, D, E, B
- C. B, D, C, A, E
- D. B, D, E, A, C

Q 26. Which among the following is a pair of films that CANNOT be shown earlier than E?

- A. A and B
- B. A and D
- C. B and C
- D. C and D

ABECD

DC

ADEBC

CB

BCEDA

AD

COEBA

BA

Q 27. In case D and E are shown as far apart from each other as possible, which among the following will always be true?

- A. A is shown earlier than B.
- B. B is shown earlier than C.
- C. C is shown earlier than E.
- D. E is shown earlier than D.

ACEBD
ABECD
BAECD

Q 28. Which number will be next in the series: 1, 7, 25, 61, 121, ?

- A. 225
- B. 221
- C. 211
- D. 231

6 18 36 60
1 3 6 10 15
30

35
27 35

Q 29. The product of the age of a mother and her two children is 4125. The difference between the age of the mother of the younger child is

- A. 25
- B. 26
- C. 27
- D. 37

$$m \times y = 4125$$

$$m - y = ?$$

$$4125 = 25 \times 165$$

$$25 = 5 \times 5$$

$$165 = 3 \times 55$$

$$3 = 3 \times 1$$

$$55 = 5 \times 11$$

$$11 = 11 \times 1$$

$$5 = 5 \times 1$$

$$1 = 1 \times 1$$

$$25 - 1 = 24$$

$$24 = 2 \times 12$$

$$12 = 2 \times 6$$

$$6 = 2 \times 3$$

$$3 = 3 \times 1$$

$$2 = 2 \times 1$$

$$1 = 1 \times 1$$

$$24 = 2 \times 12$$

$$12 = 2 \times 6$$

$$6 = 2 \times 3$$

$$3 = 3 \times 1$$

$$2 = 2 \times 1$$

$$1 = 1 \times 1$$

$$24 = 2 \times 12$$

$$12 = 2 \times 6$$

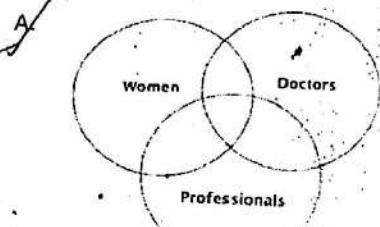
$$6 = 2 \times 3$$

$$3 = 3 \times 1$$

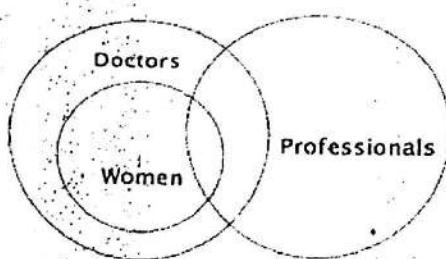
$$2 = 2 \times 1$$

$$1 = 1 \times 1$$

Q30. Which diagram best represents the relation among doctors, professional and women?

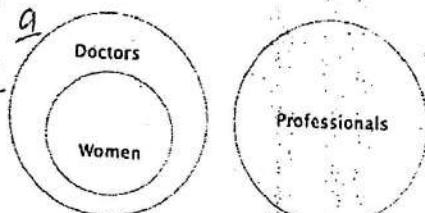


B. $\frac{(\pi + 2\pi)}{4}$



D. $a^2 + a^2 = \frac{5a^2}{4}$

$\sin \theta = \frac{a}{\sqrt{a^2 + a^2}}$



$\frac{3\pi}{4}$

$\frac{3 \times 100 \times \pi}{4} = \frac{75\pi}{2}$

$\frac{\sqrt{5}a}{2}$

Q31. The derivative of $f(x) = x|x|$, $-1 \leq x \leq 1$ is

A. $\frac{\pi}{2}$

$\begin{cases} -2x & x \leq 0 \\ 2x & x \geq 0 \end{cases}$

B. $\begin{cases} 2x & x \leq 1 \\ -2x & x \geq -1 \end{cases}$

C. $\begin{cases} 2x & x \leq 1 \\ -2x & x \geq -1 \end{cases}$

D. $\begin{cases} -2x & x \geq 1 \\ 2x & x \leq 1 \end{cases}$

$\sin \theta = \frac{2}{\sqrt{4x^2 + 1}}$

$\frac{2}{\sqrt{4x^2 + 1}} = \frac{2}{\sqrt{4x^2 + 1}}$

$\frac{2}{\sqrt{4x^2 + 1}} = \frac{2}{\sqrt{4x^2 + 1}}$

$\frac{2}{\sqrt{4x^2 + 1}} = \frac{2}{\sqrt{4x^2 + 1}}$

Q32. A particle has two equal accelerations in two given directions. If one of the accelerations is halved, then the angle, which the resultant makes with the other, is also halved. The angle between the accelerations is

- A. 120°
B. 90°
C. 60°
D. 45°

$\sin \theta = \frac{1}{2}$

$a_r = \sqrt{a_1^2 + a_2^2 + 2a_1 a_2 \cos \theta}$

$\frac{\sin \theta}{2} = \frac{\sin \theta}{2}$

$\sin \theta = \frac{1}{2}$

$\sin \theta = \frac{1}{2}$

Q 33. Let $f(x)$ be differentiable at x_0 , $a \leq x_0 \leq b$ and let $f'(x_0) = 0$. If $f''(x)$ exists and is continuous in neighborhood of x_0 , then

- A. $f(x)$ has a maximum at $x = x_0$ when $f''(x_0) > 0$.
- B. $f(x)$ has a minimum at $x = x_0$ when $f''(x_0) < 0$.
- C. $f(x)$ has a maximum at $x = x_0$ when $f''(x_0) < 0$.
- D. $f(x)$ has a maximum at $x = x_0$ when $f''(x_0) = 0$.

S V
L S

Q 34. Green's theorem provide relationship

- A. Between double integral over a region R and the line integral over the closed curve C bounding R .
- B. Between triple integral over a volume V and the line integral over the closed curve C bounding R .
- C. Between double integral over a region R and the line integral over the open curve C .
- D. Between double integral over a region R and the triple integral over the volume V .

Q 35. Let X_1, X_2, \dots, X_n be a random sample from a population with mean μ and

variance σ^2 . If $\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i$ is the sample mean, then what is the standard of \bar{X} ?

- A. $\frac{\sigma}{\sqrt{n}}$
- B. $\frac{\sigma^2}{n}$
- C. $\frac{\sigma}{n}$
- D. σ

Q 36. Let X_1, X_2, \dots, X_n are independent and each X_i has a mean μ and variance σ^2 .

If $\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i$, what is the distribution of \bar{X} when n is large?

- A. $N(n\mu, \frac{\sigma^2}{n})$
- B. $N(n\mu, \sigma^2)$
- C. $N(\mu, \frac{\sigma^2}{n})$
- D. $N(\mu, \sigma^2)$

Q 37. A coin is tossed 10 times. We wish to test the hypothesis that the coin is fair. Let p be the probability that the coin shows a head. Then which of the following represents the null hypothesis?

- A. $H_0 : p > 0.5$
- B. $H_0 : p < 0.5$
- \rightarrow C. $H_0 : p = 0.5$
- D. $H_0 : p \neq 0.5$

\rightarrow means

Q 38. Let

$$M = \begin{pmatrix} 3 & 1 & 1 \\ 2 & 0 & 3 \\ -1 & -2 & 1 \end{pmatrix}, \text{ then } M \text{ satisfies}$$

- A. $M^3 - 3M^2 + 2M + 11 = 0$
- B. $M^3 - 4M^2 + 8M + 9 = 0$
- C. $M^3 + 4M^2 + 8M - 9 = 0$
- D. $M^3 - 4M^2 + 8M - 9 = 0$

$$\begin{pmatrix} 3-\lambda & 1 & 1 \\ 2 & 0-\lambda & 3 \\ -1 & -2 & 1-\lambda \end{pmatrix} \quad (3-\lambda)[-(1-\lambda) + 6] - 1$$

Q 39. The skew-symmetric part of matrix

$$M = \begin{pmatrix} -1 & -3 & 0 \\ 2 & 3 & 5 \\ 1 & 0 & 2 \end{pmatrix} \text{ is}$$

$$\frac{1}{2} (m - m')$$

~~A.~~ $\begin{pmatrix} 0 & -5 & -1 \\ 5 & 0 & 5 \\ 1 & -5 & 0 \end{pmatrix}$

$$\frac{1}{2} \begin{pmatrix} -1 & -3 & 0 \\ 2 & 3 & 5 \\ 1 & 0 & 2 \end{pmatrix} - \begin{pmatrix} -1 & 2 & 1 \\ -3 & 3 & 0 \\ 0 & 5 & 2 \end{pmatrix}$$

~~B.~~ $\frac{1}{2} \begin{pmatrix} 0 & -5 & -1 \\ 5 & 0 & 5 \\ 1 & -5 & 0 \end{pmatrix}$

$$\begin{pmatrix} -2 & -1 & -1 \\ -1 & 0 & 5 \\ 1 & -5 & 0 \end{pmatrix}$$

~~C.~~ $\frac{1}{2} \begin{pmatrix} -2 & -1 & -1 \\ -1 & 6 & 5 \\ 1 & 5 & 4 \end{pmatrix}$

$$\begin{pmatrix} -1 & 3 & 0 \\ 2 & 3 & 5 \\ 1 & 0 & 2 \end{pmatrix} - \begin{pmatrix} -1 & 2 & 1 \\ -3 & 3 & 0 \\ 0 & 5 & 2 \end{pmatrix}$$

~~D.~~ $\frac{1}{2} \begin{pmatrix} 2 & -1 & 1 \\ 1 & 6 & -4 \\ 1 & -5 & 4 \end{pmatrix}$

$$\begin{pmatrix} 0 & -5 & -1 \\ 0 & 0 & 5 \\ 5 & 0 & 5 \end{pmatrix}$$

Q40. The residue of the complex function

$$f(z) = \frac{z}{2z+z^2-z^3}$$

$\frac{3}{2+z-z^2}$

about the point $z_0 = 0$ is

- A. 1
- B. 3
- C. $\frac{5}{2}$
- D. $\frac{3}{2}$

$$\frac{3z}{2z+z^2-z^3} = \frac{3}{2} + z^{-2}$$

$\frac{-1 \pm i\sqrt{5}}{2}$

Q41. Let C be a closed contour and $f(z)$ be a complex valued function

$$f(z) = \frac{1}{(z^2+1)^2}, \text{ Then, } \oint_C f(z) dz \text{ is equal to}$$

$$\left(\frac{1}{(z^2+1)}\right)^2 = \frac{Ae^{in\theta} + Be^{-in\theta}}{z^2+1}$$

- A. π
- B. $\frac{\pi}{4}$
- C. $\frac{\pi}{6}$
- D. $\frac{\pi}{2}$

$$\frac{1}{2} \frac{d^2}{dz^2} - \frac{2}{(z^2+1)^3} + \frac{(n+0)}{(z^2+1)^2}$$

Q42. The inverse of matrix $\begin{pmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 3 & -2 & 2 \end{pmatrix}$ is $\frac{1}{|A|} (\text{adj } A)$

$$(2+i)(z-i) A = \begin{pmatrix} -2 & 0 & 1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{pmatrix} \begin{pmatrix} 30-30 & -25+36 \\ -6+5 & 2-5 \\ 0 & 0 \end{pmatrix} = \begin{pmatrix} 5-6 & 0 & 0 \\ -15+15 & -1 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$

$$\begin{bmatrix} 2 & 0 & -1 \\ -5 & -1 & 0 \\ 0 & 1 & 3 \end{bmatrix} = 1$$

$$D. \begin{pmatrix} 2 & 0 & 1 \\ 5 & -1 & 0 \\ 0 & 1 & -3 \end{pmatrix} \left\{ \begin{matrix} 1 \\ 1 \\ n \end{matrix} \right\} \left\{ \begin{matrix} 3 \\ 3 \\ 3 \end{matrix} \right\}$$

$$3+3+3n=0$$

$$3n = -6$$

$$\cancel{3n_1} + 2n_2 - n_3 = 0$$

$$n_2 = n_3$$

$$= 14n_2$$

Q.43. If $\begin{bmatrix} 1 & 1 & x \end{bmatrix} \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = 0$, then the value of x is

- A. -2
 B. 2
 C. 6
 D. -6

$$3 + 3 + 3^n = 0 \quad 2n+8 + 2 + n + 3 \\ 3n = -6 \quad 6 + 3n = 0 \\ n = -2$$

Q44. Let $A = \begin{bmatrix} 4 & -2 & 1 \\ 2 & 0 & 1 \\ 2 & -2 & 3 \end{bmatrix}$, $v_1 = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$, $v_2 = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$, $v_3 = \begin{bmatrix} 1 \\ 1 \\ 4 \end{bmatrix}$ and $v_4 = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$. Then, which of the following statement is correct?

- A. v_1 and v_2 are eigenvectors of A
 - B. v_1 and v_3 are eigenvectors of A
 - C. v_2 and v_3 are eigenvectors of A
 - D. v_3 and v_4 are eigenvectors of A

Q 45. Which of the following is an eigenvector of

$$M = \begin{bmatrix} 1 & 2 & -1 \\ 1 & 0 & 1 \\ 4 & -4 & 5 \end{bmatrix}$$

$$\left[\begin{array}{ccc|c} 0 & 2 & -1 & x_1 \\ 1 & 0 & 1 & x_2 \\ 4 & -4 & 4 & x_3 \end{array} \right] \xrightarrow{\text{Row operations}} \left[\begin{array}{ccc|c} 1 & 0 & 1 & x_2 \\ 0 & 2 & -1 & x_1 - 4x_2 \\ 0 & -4 & 4 & x_3 - 4x_2 \end{array} \right]$$

A. $\begin{bmatrix} -2 \\ 1 \\ 5 \end{bmatrix}$ B. $\begin{bmatrix} 2 \\ -1 \\ 4 \end{bmatrix}$ C. $\begin{bmatrix} -2 \\ 1 \\ 4 \end{bmatrix}$ D. $\begin{bmatrix} 2 \\ -1 \\ 5 \end{bmatrix}$

$$2x_2 = x_3$$

Q 46. Given that 0 is an eigenvalue of

$A = \begin{bmatrix} 2 & 1 \\ 2 & i \end{bmatrix}$, then its corresponding eigenvectors be given by

$$\begin{pmatrix} 0 & 1 \\ 2 & -1 \end{pmatrix} \begin{pmatrix} t_1 \\ t_2 \end{pmatrix} =$$

$$q - \lambda = 0 \quad \lambda = 1$$

$$2\omega - 2t_1$$

A. $\begin{bmatrix} 2t \\ t \end{bmatrix}, t \in R, t \neq 0$ B. $\begin{bmatrix} t \\ 2t \end{bmatrix}, t \in R, t \neq 0$

C. $\begin{bmatrix} -t \\ 2t \end{bmatrix}, t \in R, t \neq 0$ D. $\begin{bmatrix} -2t \\ t \end{bmatrix}, t \in R, t \neq 0$

Q 47. The solution of the equation $(D^2 + 6D + 25)y = 0$ is

- A. $e^{(-3+4i)x}$
 B. $e^{(-3-4i)x}$
 C. $e^{-3x}(A \cos 4x + B \sin 4x)$
 D. (a), (b), (c) all are solution

Q 48. The equation $x \frac{dx}{dy} + y = xy^3$ is reducible to linear form by substituting

- A. $z = y^2$
 B. $z = y^{-2}$
 C. $z = y^3$
 D. $z = y^{-3}$

Q 49. The solution of differential equation $2xy' = xy + y^3$ is

- A. $e^{x/y^2} = c$
 B. $e^{y^2/x} = c$
 C. $xe^{y^2/x} = c$
 D. $xe^{x/y^2} = c$

Q 50. The Fourier sine transform of $e^x, x \geq 0$ is

- A. $\sqrt{2/\pi}[s/(1+s^2)]$
 B. $\sqrt{2/\pi}[1/(1+s^2)]$
 C. $\sqrt{\pi/2}[(1+s^2)/s]$
 D. $\sqrt{\pi/2}[s/(1+s^2)]$

Q 51. The integrating factor needed to reduce the differential equation $(2x \log x - xy)dy + 2ydx = 0$ to an exact equation is

- A. x
 B. x^2
 C. $\log x$
 D. $1/x$

$$\begin{aligned} m^2 + 6m + 25 &= 0 \\ -6 \pm \sqrt{36 - 100} &= -6 \pm 4i \\ -6 \pm 4i &= 2 \\ -1 - 5i &= 2 \\ -3 &= 2 \\ 2y + y^3 &= \frac{y^2}{2} \\ 2y + y^3 &= \frac{y^2}{2} \\ \frac{dy}{dx} &= \frac{y^2 + y^3}{2y} \\ \frac{dy}{dx} &= \frac{y^2(1+y)}{2y} \\ \frac{dy}{dx} &= \frac{y(1+y)}{2} \end{aligned}$$

Q.52. If the observations (x, y) of an experiment are $(1, 2), (2, 3), (3, 4)$ the slope of the best line passing through the origin is

- A. 0
- B. $10/7$
- C. $7/10$
- D. 1

Q.53. The wronskian of two functions $x^2, x^2 \log x$ is

- A. x^2
- B. $2x^3$
- C. $x^5 x^3 \log x$
- D. x^3

Q.54. The Laplace transformation of $(1-e^{-t})/t$ is

- A. $(s-1)/s$
- B. $s/(s-1)$
- C. $\log((s-1)/s)$
- D. $\log(s/(s-1))$

Q.55. The set of function $(x, 1/x)$ forms a basis of differential equation

- A. $y'' + y' - y = 0$
- B. $x^2 y'' + xy' = 0$
- C. $x^2 y'' + y' - y = 0$
- D. $x^2 y'' + xy' - y = 0$

Q.56. The solution of differential equation $\sqrt{1 - \left(\frac{dy}{dx}\right)^2} = d^2y/dx^2$ is

- A. $y = -\cos(x+a) + b$
- B. $y = \cos(x-a) + b$
- C. $y = \sin(x+a) + b$
- D. $y = \sin(x+a)$

Q.57. The solution of differential equation $x^2 (d^2y/dx^2) + x(dy/dx) - y = 0$ is

- A. $y = (C_1 + C_2 \log x)x$
- B. $y = (C_1 + C_2 x)e^x$
- C. $y = C_1 e^x + C_2 e^x$
- D. $y = C_1 x + C_2/x$

Q.58. If 1 is an eigenvalue of matrix $A = \begin{bmatrix} 2 & 5 & -6 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$, then other two eigenvalues are

C₁

$$m^2 + \frac{1}{x} m^2 - y^{10}$$

$$m^2 + 120/16$$

$$m^2 - y^1$$

$$2 - 2x^2 = 0$$

$$\frac{dy}{dx} + \frac{1}{x} y^2$$

$$-\frac{y^3}{x^2} - \frac{1}{x^2} y^2 \frac{dy}{dx}$$

$$y = -\frac{y^2}{x}$$

$$\begin{bmatrix} 1 & -2 & 1 \\ 2 & 0 & 1 \\ 2 & -2 & 3 \end{bmatrix}$$

$$n_1 = 2n_2 + n_3$$

$$2n_1 = -n_3$$

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

Q.59. Let z be a complex variable, $z = x + iy$, then the value of the integral

$$z^9 = 1$$

$$z = e^{i\theta}$$

- A. $\frac{1}{4}$
 B. 1
 C. $\frac{1}{2}$
 D. $\frac{1}{8}$

$$\int_C \frac{dz}{z^4 - 1}$$

$$\log(z-1)$$

$$4i\theta$$

$$(n+iy)^{n-i}$$

$$2 = e^{i\theta}$$

$$\begin{bmatrix} 0 & -2 & 1 \\ 2 & 0 & 1 \\ 2 & -2 & -1 \end{bmatrix} \begin{bmatrix} n_1 \\ n_2 \\ n_3 \end{bmatrix}$$

$$+ | 2n_2 = n_3$$

Q.60. The diagonal elements of a Hermitian matrix are

- A. Real
 B. In the form of $a + ib$, where a and b are real
 C. Zero
 D. Purely imaginary

$$2n_1 = -n_3$$

Q.61. Solution of $(dl/dt) + 2l = 10, l(0) = 0$ is

- A. $5(1+e^{-2t})$
 B. $5e^{-2t}$
 C. $5(1-e^{-2t})$
 D. $5e^{2t}$

$$y e^{2t} = \int 10 e^{-2t} dt$$

$$y = \frac{10 e^{-2t}}{-2} + C e^{-2t}$$

$$y = \frac{10}{2} e^{-2t} + C e^{-2t}$$

$$y = 5 e^{-2t} + C e^{-2t}$$

$$y = 5 + C e^{-2t}$$

$$y = 5 + 2L$$

$$\frac{10 - 2L}{S}$$

Q.62. In a half range sine series of $f(x) = x, 0 < x < 2$, the Fourier coefficient b_n is

- A. $(-1)^{n-1} 2/n\pi$
 B. $(-1)^{n-1} 4/n\pi$
 C. $(-1)^n 2/n\pi$
 D. $(-1)^n 4/n\pi$

$$b_n = \int_0^2 x \sin nx$$

$$= \int_0^2 x \left[-\frac{\cos nx}{n} \right] + \left[\frac{\sin nx}{n^2} \right]$$

Q.63. For a square membrane, of side 'a', in any mode of vibration, the angular frequencies are expressed with two integers n and r and velocity c as

- A. $(c\pi/a)(n^2+r^2)^{1/2}$
 B. $(c\pi/a)(n/r)^{1/2}$
 C. $(c\pi/a)(n^2-r^2)^{1/2}$
 D. $(c\pi/a)(n+r^2)$

$$\begin{aligned} & (2^{-1})(2+1)(2+1) + \frac{C_{n+r}}{2^{-1}} \\ & (2^{-1})(2+1)(2+1) + \frac{C_{n+r}}{2^{-1}} \\ & (2+1)(2+1) \end{aligned}$$

$$\frac{1}{\pi} \int_0^\pi x \cos nx dx = \frac{x \sin nx}{n} \Big|_0^\pi - \int \frac{\sin nx}{n} dx$$

$$= \frac{1}{n} \sin nx \Big|_0^\pi$$

Q.64. The finite Fourier cosine transforms of $f(x) = x$ in $(0, \pi)$ is

- A. 0
- B. π/s
- C. $(-1)^s \pi/s$
- D. $(-1)^{s+1} \pi/s$

Q.65. The differential equation $\sqrt{1 - \left(\frac{dy}{dx}\right)^2} = d^2y/dx^2$ is a

- A. Nonlinear equation of 2nd order 1st degree
- B. Nonlinear equation of 2nd order 2nd degree
- C. Linear equation of 2nd order 2nd degree
- D. Linear equation of 2nd order 1st degree

Q.66. A body falling vertically under constant acceleration due to gravity and the force of air resistance is proportional to velocity (a is proportional constant) then the terminal velocity is

- A. ag
- B. g/a
- C. $g/2a$
- D. $2g/a$

$$\frac{dy}{dt} = \frac{d^2y}{dt^2}$$

$$1 - \left(\frac{dy}{dt}\right)^2 = \left(\frac{d^2y}{dt^2}\right)$$

Q.67. On conducting a test of significance the p -value is 0.1. Which of the following statements is true?

- A. The null significance is true
- B. The null significance is false
- C. The data are inconsistent with the null hypothesis
- D. There are strong evidence against the null hypothesis

$$z = \frac{105 - 100}{10} = 0.5$$

Q.68. 25 students of a school were tested for their IQ. The mean was 105. Then, the difference of this mean from that of the population, which has a mean IQ of 100 and a standard deviation 10, is

- A. 3.5
- B. 2.5
- C. 1.5
- D. 0.5

$$\underline{105}$$

$$\text{variance} = 10$$

$$100$$

Q.69. The reciprocal of the standard error is taken as the measure of -

- A. Reliability
- B. Estimate of the parameter
- C. Level of significance
- D. Statistics

Precise value

Q 70. A random sample of 500 pineapples was taken from a large consignment and 65 were found to be bad. Then, the standard error of the population of bad ones in the sample of this size is

- A. 0.015
- B. 0.13
- C. 0.87
- D. 0.045

$$\begin{array}{r} 15 \\ 65 \\ \hline 500 \\ 100 \end{array}$$

$$N = 500$$

Q 71. In Fraunhofer's class of diffractions

- A. Wave front are circular
- B. Plane wave front
- C. Elliptical
- D. Circular and elliptical

$$\begin{array}{r} 105 \\ 100 \\ \hline 5 \end{array}$$

$$N = 500$$

435

Q 72. If $\vec{E}_s = 10 e^{j4x} \vec{a}_y$, which of these is not correct representation of \vec{E} ?

- A. $10 \sin(\omega t + 4x) \vec{a}_y$
- B. $10 \cos(\omega t + 4x) \vec{a}_y$
- C. $\operatorname{Re}(\vec{E}_s e^{-j\omega t})$
- D. $\operatorname{Re}(\vec{E}_s e^{+j\omega t})$

$$\begin{array}{r} 105 \\ 100 \\ \hline 5 \end{array}$$

Q 73. Identify which of the following expressions are not Maxwell's equations for time-varying fields :

- A. $\nabla \cdot \vec{D} = \rho_v$
- B. $\oint \vec{H} \cdot d\vec{l} = \int (\sigma \vec{E} + \epsilon \frac{\partial \vec{E}}{\partial t}) \cdot d\vec{S}$
- C. $\oint \vec{B} \cdot d\vec{S} = 0$
- D. $\nabla \cdot \vec{E} = - \frac{\partial \vec{B}}{\partial t}$

Q 74. The concept of displacement current was a major contribution attributed to,

- A. Faraday
- B. Lenz
- C. Maxwell
- D. Lorentz

$$\begin{array}{r} 105 \\ 100 \\ \hline 5 \end{array}$$

Q 75. For a lossy transmission line, the characteristic impedance does not depend on

- A. The length of the line
- B. The operating frequency of the line
- C. The conductivity of the conductors
- D. The conductivity of the dielectric separating the conductors

would j w u

Q76. A solenoid has dimensions $L=1.2$ m, $N=750$ turns, diameter = 10 cm, and current $I=1.75$ A, $\mu_r=5$. The field inside the solenoid is,

- A. 109 kA/m
- B. 5450 A/m
- C. 1.09 kA/m
- D. 545 A/m

$$\text{Ans. } \frac{1}{2} \cdot \frac{375}{5 \times 750 \times 1.75} \cdot \frac{\mu_0 N^2}{2} = \frac{4\pi \times 10^{-7} \times 750 \times 1.75}{2}$$

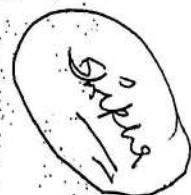
Q77. A plane circular loop of conducting wire of radius 10 cm which possesses 15 turns is placed in a uniform magnetic field. The direction of the magnetic field makes an angle of 30° with respect to the normal direction to the loop. The magnetic field strength B increases at a constant rate from 1 Tesla to 5 Tesla in a time interval of 10s. The emf generated around the loop is,

- A. 163 V
- B. 16.3 V
- C. 1.63 V
- D. 0.163 V

$$\text{Ans. } r = 10 \text{ cm}, n = 15, \theta = 30^\circ, \frac{dB}{dt} = \frac{4T}{10s} = 0.4 \text{ T/s}, \text{emf} = N \frac{dB}{dt} \cos \theta$$

Q78. The electric constant of pure water is 80. The Brewster angle for parallel polarization is,

- A. $\sin^{-1} \frac{1}{\sqrt{80+1}}$
- B. $\sin^{-1} \frac{1}{\sqrt{80-1}}$
- C. $\sin^{-1} \frac{1}{\sqrt{80}}$
- D. $\sin^{-1} \frac{1}{\sqrt{80-1}}$



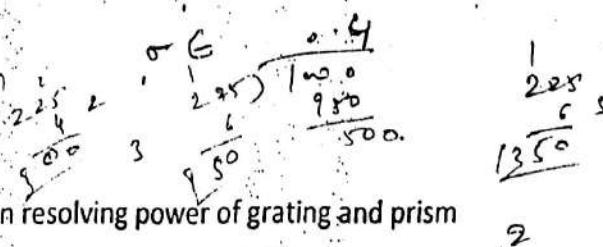
$$\text{Ans. } \tan \theta = \frac{1}{\sqrt{80}} \Rightarrow \theta = \sin^{-1} \frac{1}{\sqrt{80}}$$

Q79. In single slit diffraction pattern intensity varies for 1st order & 2nd order

- A. 1:1/10:1/20
- B. 1:1/22:1/61
- C. 1:1/25:1/25
- D. 1:1/22:1/44

Q 80. A non-magnetic material have $\sigma = 10^{-4} \text{ s/m}$, $\epsilon_r = 2.25$. The loss tangent is,

- A. 0.16
- B. 0.32
- C. 0.64
- D. 1.28



Q 81. The comparison between resolving power of grating and prism

- A. Resolving power of prism > Resolving power of grating
- B. Resolving power of prism = Resolving power of grating
- C. Resolving power of prism < Resolving power of grating
- D. Resolving power of prism & grating is zero

Q 82. The wave equation for the electric field in a lossless medium is,

- A. $\nabla^2 \vec{E} = -\omega^2 \mu \epsilon \vec{E}$
- B. $\nabla^2 \vec{E} = -\omega \mu \epsilon \vec{E}$
- C. $\nabla^2 \vec{E} = -\omega \sqrt{\mu \epsilon} \vec{E}$
- D. $\nabla^2 \vec{E} = -\omega^2 \mu \epsilon \vec{E}^2 n$

Q 83. Ruby laser is

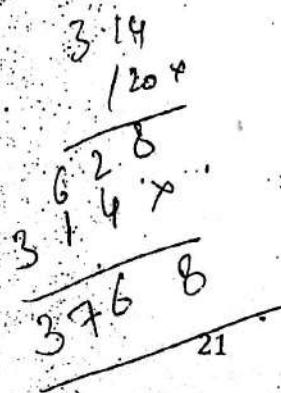
- A. Two energy level system
- B. Three energy level system
- C. Four energy level system
- D. One energy level system

Q 84. Population inversion is not possible in

- A. Four energy level system
- B. Two energy level system
- C. Three energy level system
- D. More than four energy level system

Q 85. The intrinsic impedance of dielectric medium for air is,

- A. 407Ω
- B. 307Ω
- C. 477Ω
- D. 377Ω



16/10
E_x = 0

Q86. The three non-zero components of TE₁₀ mode are,

- A. E_x, H_y and H_z
- B. E_y, H_x and H_z
- C. E_x, E_y and H_z
- D. E_y, E_z and H_x

E_x
H_y

Q87. Limit of resolution of the telescope is

Resolution $\propto \frac{1}{D}$

- A. Directly proportional to resolving power
- B. Inversely proportional to resolving power
- C. Directly proportional to D diameter of lens aperture
- D. Inversely proportional to wavelength

Q88. A copper wire of 0.25 cm in diameter carries a current of 50 ampere. The permeability constant μ_0 is $4\pi \times 10^{-7}$ Wb/Am. The magnetic field induction B at the surface of the wire is,

- A. 8×10^{-3} Wb/m²
- B. 16×10^{-3} Wb/m²
- C. 1.6×10^{-3} Wb/m²
- D. 0.8×10^{-3} Wb/m²

$$B = \frac{\mu_0 I}{2\pi r} = \frac{4\pi \times 10^{-7} \times 50}{2 \times 0.25 \times 10^{-2}} = \frac{4\pi \times 10^{-7} \times 50}{0.5 \times 10^{-2}}$$

Q89. The magnitude of curl of magnetic field $\vec{H} = xy\hat{a}_x - xz\hat{a}_z$ at point (x=0, y=1, z=0) is,

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

$$\nabla \times \vec{H} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ \partial_x & \partial_y & \partial_z \\ xy & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -xy \end{vmatrix} = -xy\hat{a}_x$$

Q90. A long wire having a semi-circular loop of radius r carries a current I. The magnetic field at the centre C due to the entire wire is,

- A. $1/R$
- B. $1/2R$
- C. $1/4R$
- D. $2/R$

$$B dl = \mu_0 I$$

$$B = \frac{\mu_0 I}{2\pi R}$$

Q91. In Negative Crystal

- ✓ A. Velocity of E-ray is faster than Velocity of O-ray
- B. Velocity of E-ray is slower than Velocity of O-ray
- C. Velocity of E-ray 0
- D. Velocity of O-ray 0

Q92. Diffusion of molecules takes place more rapidly if

- A. Volume of container increases and pressure decreases
- B. Volume of container decreases and pressure increases
- C. Volume of container decreases and pressure decreases
- D. Volume of container increases and pressure increases

$PV_2 RT$

Q93. In Compton effect:

- A. Scattering of the photon and recoil of electron take place simultaneously.
- B. Electron recoils after scattering of photon
- C. Scattering follows recoil of electron
- D. There is no correlation between the two events

Q94. Which of the following represents the electro-optic effect?

- A. Zeeman effect
- B. Paschen-Back effect
- C. Compton effect
- D. Stark effect

Q95. Combination of four factors, density of fluid (ρ), average forward velocity (v), viscosity (η) and diameter of the pipe (D) determine the Reynold's number as

- A. $N_R = \rho \eta D / v$
- B. $N_R = \rho \eta v / D$
- C. $N_R = v \eta D / \rho$
- D. $N_R = \rho v D / \eta$

$$\rho \eta D / v$$

Q96. In Maxwell-Boltzmann law of distribution of velocities, in curves for various temperatures, the peak corresponds to a speed given by

- A. $\sqrt{kT/m}$
- B. $\sqrt{2kT/m}$
- C. $\sqrt{3kT/2m}$
- D. $\sqrt{3kT/2m}$

Q97. The rest energy E_0 of an electron is

- A. 4.84 MeV
- B. 4.87 MeV
- C. 4.92 MeV
- D. 5.11 MeV

$$\begin{array}{r} 1.3 \\ 1.6 \\ 7.8 \\ 1.3 \\ 2.0 \\ 2.23 \end{array}$$

Q98. If $\gamma = 1/\sqrt{1 - v^2/c^2}$, the Lorentz transformation for velocity in the x-direction is

A. $v'_x = \frac{v_x - v}{1 - (vv_x/c^2)}$

B. $v'_x = \frac{v_x - v}{\gamma [1 - (vv_x/c^2)]}$

C. $v'_x = \frac{v_x + v}{1 - (vv_x/c^2)}$

D. $v'_x = \frac{v_x - v}{\gamma [1 + (vv_x/c^2)]}$

Q99. A spaceship moving away from earth at a speed of $0.8c$ fires a missile in the same direction. As observed from the spaceship the missile moves at a speed of $0.5c$. What the speed of the missile is as observed from earth?

A. $0.87c$

B. $0.89c$

C. $0.91c$

D. $0.93c$

Q100. The Lorentz transformation equation for time is given as

A. $t' = \frac{t - (v/c^2)x}{\sqrt{1 - (v^2/c^2)}}$

B. $t' = \frac{t + (v/c^2)x}{\sqrt{1 - (v^2/c^2)}}$

C. $t' = \frac{t - (v/c^2)x}{\sqrt{1 + (v^2/c^2)}}$

D. $t' = \frac{t + (v/c^2)x}{\sqrt{1 + (v^2/c^2)}}$

Q101. The postulates of special relativity theory states that

A. The laws of physics are the same in all reference frames.

B. There exists a preferential inertial reference frame

C. The speed of light in free space has the same value c in all inertial systems

D. The speed of light in free space has the same value c in all reference systems

Q102. Michelson-Morley experiment establishes that

A. Ether fills all space and is the medium with respect to which the speed of light c applies

- B. An observer moving through a medium at velocity V would measure the speed of light as $C' = C + V$.
- C. A spherical wave front of light emitted from a point source in one inertial frame will appear as spherical to an observer in any other inertial frame.
- D. The speed of light depends on the motion of the source or the receiver.

Q103. The acceleration of a freely falling elevator is $\vec{a} = -g\hat{k}$. The fictitious force acting on a mass M in this non-inertial frame is

A. $\vec{F} = -Mg\hat{k}$

B. $\vec{F} = -\frac{1}{2}Mg\hat{k}$

C. $\vec{F} = Mg\hat{k}$

D. $\vec{F} = \frac{1}{2}Mg\hat{k}$

$$\vec{F} = -g\hat{k}$$

Q104. The maximum kinetic energy of photoelectrons in a photoelectric effect depends on

- A. Intensity of incident light
- B. Frequency of the incident light
- C. Polarization of incident light
- D. Angle of incidence

$$\frac{1}{me} h(1 - \cos \theta)$$

Q105. Which of the following is not a dissipative force?

- A. Frictional force
- B. Viscous force
- C. Damping force
- D. Central force

Q106. Which of the following is not a property of the work done by a conservative force?

- A. It only depends only on the starting and the end point and is independent of the path of the body
- B. It is equal to the difference between the initial and final potential energy
- C. It is completely irreversible
- D. If the path forms a closed loop, the total work is zero.

Q107. A block of mass m_1 moving at speed v_1 collides with a mass m_2 at rest. What is the coefficient of restitution if the mass m_1 comes to rest after collision?

- A. m_1/m_2
- B. $(m_1+m_2)/m_1$
- C. m_2/m_1
- D. $(m_1+m_2)/m_2$

$$\frac{1}{m_1} + \frac{1}{m_2}$$

$$m_1 v_1 + m_2 v_2 = 0$$

$$\frac{neV}{m}$$

$$v = \omega r$$

$$f = \frac{1}{2\pi} \omega$$

$$f = \frac{qB}{2\pi m}$$

Q 108. The cyclotron frequency is the frequency of a particle of charge q and mass m moving perpendicular to a uniform magnetic field B and is expressed as

- A. $f = qB/\pi m$
- B. $f = qB/2\pi m$
- C. $f = qB/3\pi m$
- D. $f = 2qB/3\pi m$

Q 109. What is the magnetic deflecting force acting on a 5-MeV proton moving in a uniform magnetic field of 1mT? The proton mass is 1.6×10^{-27} kg and charge 1.6×10^{-19} C. The magnetic field points in the direction of motion of proton

- A. 5.54×10^{-15} N
- B. 5.74×10^{-15} N
- C. 5.94×10^{-15} N
- D. 6.14×10^{-15} N

$$5 \text{ MeV} \times 1.6$$

$$B = 1 \text{ mT}$$

$$f = q(V/B)$$

$$V = 5 \text{ MeV}$$

$$m = 1.6 \times 10^{-27} \text{ kg}$$

$$q = 1.6 \times 10^{-19}$$

Q 110. Kinetic energy of a 400gm uniform sphere rolling without slipping on a plane surface at a speed of 2.5cm/s is equal to

- A. 1.6×10^{-4} J
- B. 1.65×10^{-4} J
- C. 1.7×10^{-4} J
- D. 1.75×10^{-4} J

$$\frac{1}{2}mv^2$$

$$\frac{1}{2} \times \frac{400}{1000} \times \frac{2.5}{100}$$

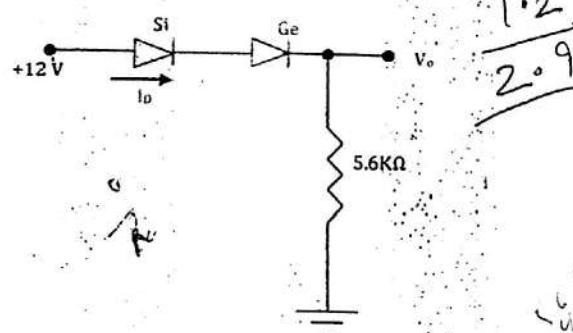
$$\frac{1}{2} \times 4 \times 2.5^2$$

$$= 2.5 + 2.5 \times 10^{-4}$$

$$= 1.49$$

Q 111. What is the value of the diode current (I_D) in the given circuit?

- A. 1.9mA
- B. 1.96mA
- C. 1.89mA
- D. 1.9mA



$$I = 1.62$$

$$\frac{1.2}{2.9}$$

$$V = 1.9$$

$$0.7$$

$$1.2$$

$$2.9$$

$$V = 1.9$$

$$1.9$$

$$1.9$$

$$1.9$$

$$1.9$$

$$1.9$$

$$1.9$$

$$1.9$$

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$$1.9$$

$$1.9$$

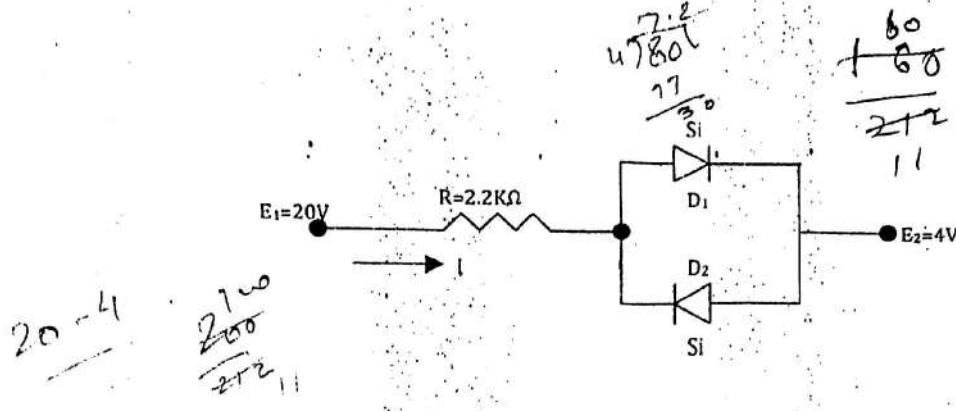
$$1.9$$

$$1.9$$

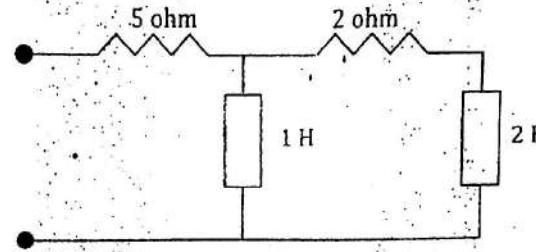
$$1.9$$

Q 112. What is the value of the current (I) in the given circuit?

- A. 6.9mA
- B. 6.95mA
- C. 6.63mA
- D. 6.6mA

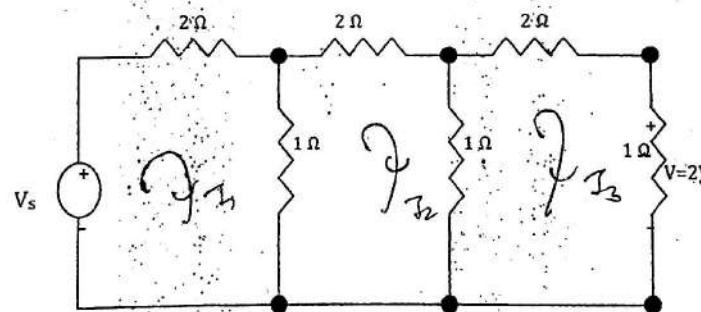


Q. 113. Find the locations of the poles and zeroes for the following network?



- A. Poles 7.86, 0.64, Zero -0.66
- B. Poles -7.86, -0.64, Zero -0.66
- C. Poles -5.86, -3.64, Zero -0.66
- D. Pole -0.66, Zeros -7.86, -0.64

Q. 114. Determine the V_s of the given network?



$$\begin{bmatrix} -V_s \\ 0 \\ 2 \end{bmatrix} = \begin{bmatrix} 1 & -1 & 0 \\ -1 & 4 & -1 \\ 0 & -1 & 4 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix}$$

$$-V_s(15) + 2 = ?$$

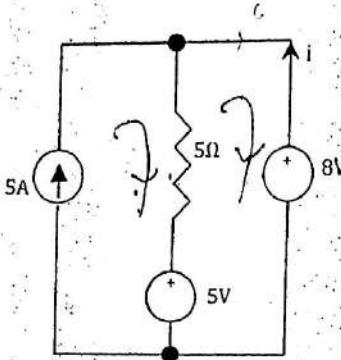
- A. 82V
- B. 41V
- C. 52V
- D. 26V

$$\begin{bmatrix} 3 & -1 & 0 \\ -1 & 4 & -1 \\ 0 & -1 & 4 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix} = \begin{bmatrix} -V_s \\ 0 \\ 2 \end{bmatrix}$$

$$\begin{aligned} 3I_1 - I_2 &= -V_s \\ 4I_2 - I_1 &= 0 \\ -I_1 + 4I_3 &= 2 \end{aligned}$$

$$\begin{aligned} -I_1 &= -15V_s + 2 \\ \frac{-15V_s + 2}{-3} &= I_1 \\ I_1 &= 5V_s - \frac{2}{3} \end{aligned}$$

Q115. Find the current i in the given network?



- A. 4.4A
- B. 2.4A
- C. -2.4A
- D. -4.4A

Q116. A voltage is represented by $V=10\sin(\omega t)$, while the corresponding current is represented by $I=5\sin(\omega t-\phi)$. What is the phase relationship between the two waves?

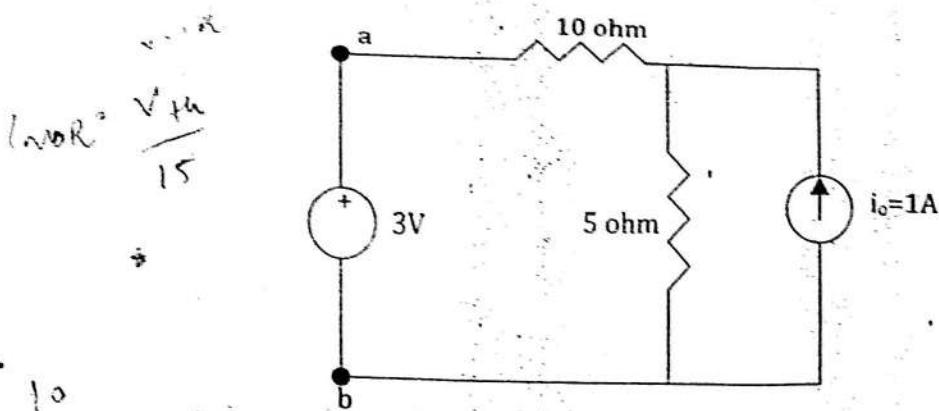
- A. I leads V by an angle ϕ
- B. I lags V by an angle $(-\phi)$
- C. I lags V by an angle ϕ
- D. I leads V by an angle $(-\phi)$

Q117. The voltage and current in an a.c. circuit are given as $V=100 \sin(314t)$; and $I=10 \sin(314t)$. What is the r.m.s. power?

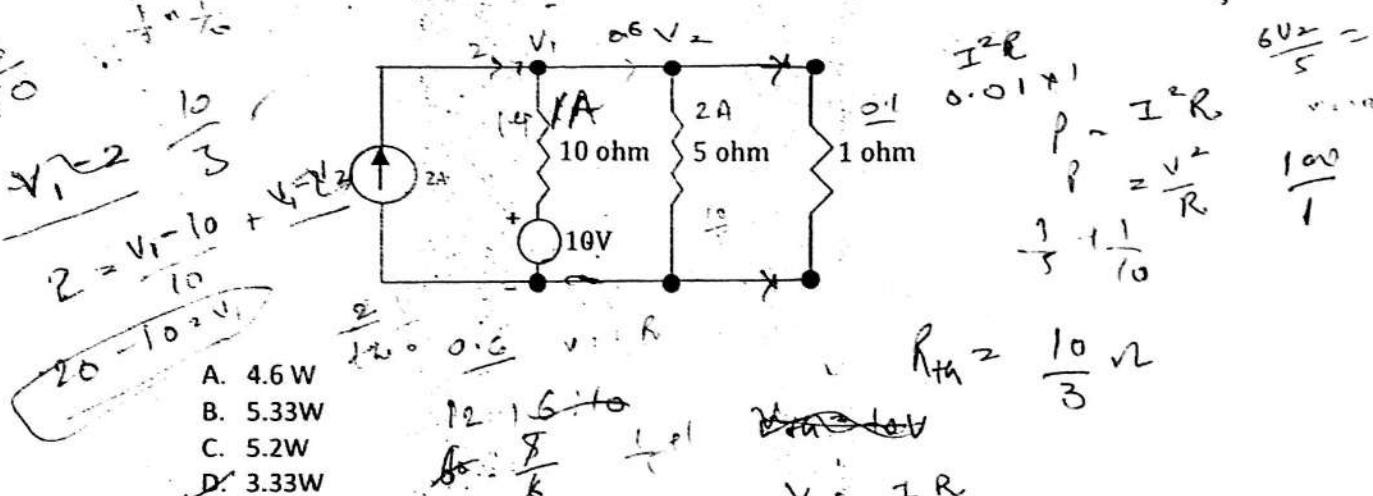
- A. 1000W
- B. 500W
- C. 700.7W
- D. 70.7W

Q118. Find the Norton's Equivalent resistance and current in the given network across a, b terminal?

- A. $I_N = 3.33A$; $R_N = 5 \Omega$
- B. $I_N = 0.333A$; $R_N = 5 \Omega$
- C. $I_N = 3.33A$; $R_N = 15 \Omega$
- D. $I_N = 0.33A$; $R_N = 15 \Omega$



Q119. What is the power loss in the 1 ohm resistor by Thevenin's theorem?



- A. 4.6 W
- B. 5.33 W
- C. 5.2 W
- D. 3.33 W

Q120. In a C-E configuration, an emitter resistor is used for:

- A. Stabilization
- B. AC signal bypass $\rightarrow C_E$
- C. Collector bias $\rightarrow R_1 \& R_2$
- D. Higher gain

Q121. Loss in MOSFET can be defined as:

- A. The minimum possible drain current
- B. The maximum possible current with V_{GS} held at -4 V
- C. The maximum possible current with V_{GS} held at 0 V
- D. The maximum drain current with the source shorted

$$V_{DS} = 2 \times \frac{10}{3}$$

$$P_D = \frac{V^2}{R} = \frac{4 \times 100}{9 \times 10} \times \frac{10}{3} = \frac{20}{3}$$

$$R_{TH} = \frac{10}{3}$$

$$\frac{40}{3} = 13$$

Q 122. With the Enhancement mode-MOSFET, when gate input voltage is zero, drain current is?

- A. At saturation
- B. Zero
- C. I_{DS}
- D. Widening the channel

Q 123. Identify the symbol?



- A. SCS
- B. PUT
- C. LASCR
- D. DIAC

Q 124. Determine the base of the numbers for the following operation to be correct:
 $54/4 = 13$

- A. 11
- B. 16
- C. 8
- D. 12

$$(54)_b \div (13)_b$$

$$54 \div 13 = 4 \text{ R } 2$$

Q 125. If we reduce the following Boolean expression to one literal, $A'B(D'+C'D) + B(A+A'CD)$ the answer would be

- A. A
- B. B
- C. C
- D. D

$$A'B D' + A' B C' D + A B + A' B C D$$

$$\cancel{B D C A' C} \\ \cancel{A B D'} + A' B D$$

Q 126. Adding, in binary, a decimal 26+27 will produce how many carry bits?

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

$$\begin{array}{r} 0010 \\ 0010 \\ \hline 001101 \end{array}$$

$$A' B + AB$$

$$B \quad 2 \quad 2 \quad 1$$

~~$$\begin{array}{r} 0111 \\ 0101 \\ \hline 001010 \end{array}$$~~

Q 127. When $y=(A+B)(A+C)$, signal A is common; therefore, y is also equal to:

- A. $A+B+C$
- B. $A + (BC)$
- C. $(AB)+C$
- D. $A + BA + BC$

$$\begin{array}{r} A + A C + A B + B C \\ A + B C \\ \hline \end{array}$$

Q 128. What is the range of invalid TTL output voltage?

- A. 0.0-0.4V
- B. 2.4-5.0V
- C. 0.4-2.4V
- D. 0.0-5.0V

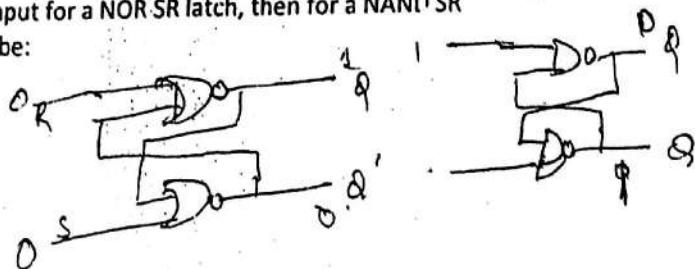
Q 129. If a parity bit is added to a four-bit word, how many output lines will be required after multiplexing?

- A. 1
- B. 5
- C. 7
- D. 9

5

Q 130. If S=0, R=0 is a "no change" input for a NOR SR latch, then for a NAND SR latch the "no change" inputs should be:

- A. S=0, R=0
- B. S=1, R=0
- C. S=0, R=1
- D. S=1, R=1



Q 131. With a 100 kHz six-stage frequency counter, what will be the period of the signal from the fifth stage?

- 32 → 2 → 5
- 32 $\times 10^{-5}$
 - 320 $\times 10^{-6}$
 - A. 320 microseconds
 - B. 40 microseconds
 - C. 0.16 milliseconds
 - D. 20 microseconds

f = 100 KHz fifth.

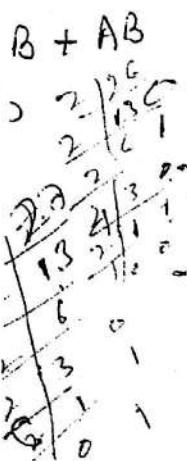
$$\frac{1}{32} \times \frac{1}{100 \text{ K}} = \frac{1}{3200000} \text{ sec}$$

A' B C D

Q 132. With internal circuits to control input gating, which type of clock signal will not be accepted by a J-K flip-flop?

- ✓ A. Dual.
- B. Level
- C. Pulse
- D. Edge

J K



Q 133. How many pins are saved by multiplexing lower order address bus with data bus in 8085 microprocessor?

- ✓ A. 8
- B. 16
- C. 1
- D. 7

$$32 \rightarrow 1 \text{ bit} \\ 2 \quad 4 \\ 3 \quad 16 \\ 2 \quad 4^0$$

31

DAC

Analog to digital.

Q 134. A staircase 4-bit ADC circuit compares which two signals?

- A. DAC output with analog output
- B. AND gate output with the clock signal
- C. Conversion complete with the DAC report
- D. 4-bit counter output with the DAC input.

Q 135. A sample and hold chip with an internal resistance of 4k ohms and a capacitor value of 0.001 microfarad will sample and then hold an accurate signal for how long?

- A. 2.5 sec
- B. 6.0 sec
- C. 3 ms
- D. 4 ms

$$t = \frac{1}{2\pi f RC} = \frac{1}{2\pi \times 10^3 \times 4 \times 10^{-9}} = 1.256 \times 10^{-3}$$

$$= 2\pi f RC$$

Q 136. An 80 MHz carrier is modulated by 400 Hz sine wave. The carrier voltage is 5 V and frequency deviation is 20 KHz. Find modulation index.

- A. 25
- B. 50
- C. 400
- D. 5

$$m_f = \frac{\Delta f}{f_m} = \frac{20 \text{ KHz}}{400 \text{ Hz}} = 50$$

Q 137. A transmitter radiates 12 KW power at 80% modulation index. The power in carrier is nearly

- A. 8.12 KW
- B. 6.66 KW
- C. 7.4 KW
- D. 9.09 KW

$$12 \text{ KW} = P_c \left(1 + \frac{m_f^2}{2} \right)$$

Q 138. One percent of 10^{12} Hz of a satellite link was used from telephony. Find the number of channel (or subscribers) if each channel is of 8 KHz.

- A. 2.5×10^7
- B. 1.25×10^7
- C. 2.5×10^8
- D. 1.25×10^6

$$\frac{100}{8} \times 10^5 \times 10^3 \times 10^6 = 1.25 \times 10^{12}$$

$$\frac{1}{100} \times 10^{12}$$

Q 139. A TV transmitter has a range of 50 KM. What is the height of TV transmitter tower? Radius of the Earth = 6.4×10^6 meters.

- A. 145 meter
- B. 165 meter
- C. 195 meter
- D. 205 meter

$$h = \frac{\lambda}{2}$$

$$\frac{\lambda^2}{4} = 3 \times 10^6$$

$$h = \frac{\lambda}{2}$$

$$6 \times 10^3$$

Q 140. The modulation techniques used for transforming digital data into analog signals are

- A. Amplitude Shift Keying (ASK) only
- B. Frequency Shift Keying (FSK) only
- C. Phase Shift Keying (PSK) only
- D. All of the above.

Q 141. During a memory read machine cycle in 8085 microprocessor, what is the status of S0 & S1 lines?

- A. S0 = 0, S1 = 0
- B. S0 = 0, S1 = 1
- ✓ C. S0 = 1, S1 = 0
- D. S0 = 1, S1 = 1

read. 1 0
with 0 1

Q 142. What is the status of AC & CY flags after execution of ANI FFH instruction in 8085 microprocessor?

- A. AC = 1, CY = 0
- ✗ B. AC = 0, CY = 0
- C. AC = 1, CY = 1
- D. Flag status will depend on contents of Accumulator.

Q 143. If a microprocessor has 16 bit address bus and A11 to A15 address lines are not connected to memory IC (i.e. They are don't care lines), then how many unique memory locations it can address

- A. 1024
- B. 2048
- C. 65535
- ✓ D. 65536

$A_{15} - A_0 \quad A_{10} \ A_9 \ A_8 \ A_7 \ A_6 \ A_5 \ A_4 \ A_3 \ A_2$

2¹⁶

2

A.

Q 144. What will be the contents of PC after the execution of following program segment?

2000H: MVI A, 30H
2002 MVI B, FFH 03
SUB B 04
05 CC 2050H

- 2008
- A. 2005H
 - B. 2007H
 - ✓ C. 2008H
 - D. 2050H

A = 30H

B = FFH

CC

30H - FFH

4096 → 12
8192 → 13
16384 → 14
32768 → 15

Q 145. What is the primary function of an Operating System?

- A. To manage computer's resources
- B. To schedule jobs for execution
- C. To manage flow of data and instructions
- D. All of the above

Q 146. Which of the following is a valid DOS file name?

- A. Personal.html
- B. personal.htm
- C. personal_file.html
- D. All of the above

Q 147. ASCII code for 'a' is

- A. 30H
- B. 41H
- C. 61H
- D. 96H

16 | 97
| 5 | 6 |
↓ 98

Q 148. ASCII stands for

- A. American System for Computer Information Interchange
- B. American Standard for Computer Information Interchange
- C. American Standard Code for Information Interchange
- D. American System Code for Information Interchange

Q 149. Which of the following statement is true for RLC instruction

- A. D7 bit is moved only to D0 bit
- B. D7 bit is moved to both Carry Flag and D0 bit
- C. D0 bit is moved only to D7 bit
- D. D0 bit is moved to both Carry Flag and D7 bit

RLC
Rotate without
left carry

Q 150. Microprocessor responds to HOLD signal

- A. immediately after receiving the signal
- B. after completing the execution of current instruction
- C. after completing the execution of current T-state
- D. after completing the execution of current machine cycle

D7 D0
D7 D0