IC-13 Serial No: 13234

ICET-2013

(Read the Instructions carefully)

Time:03 Hours Max. Marks: 150

Roll No [redacted]

Name of the Candidate: [redacted]
(in capital letters)

Name of the Centre [redacted]

Signature of the Candidate

Instructions

1. Fill up the information above by Pen/Ball Point Pen (Black or Blue).
2. The OMR sheet to mark your answers 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 fill the circle completely on the OMR Sheet in black/blue 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 disqualifiedfrom 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 40 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.

ICET - 2013

Find the answer that best matches the underlined word or phrase.

Q1. He (disposed of) the old materials.

(A) fell away
(B) threw away
(C) went away
(D) cut away

Q2. Please (submit) your application before two o'clock.

(A) hand in
(B) hand down
(C) hand off
(D) hand out

Q3. Raju and Sanjay (are friendly with) each other.

(A) get by with
(B) get along with
(C) get over with
(D) get through with

Q4. Were you able to (recover) your stolen laptop?

(A) get back
(B) reach back
(C) go back
(D) come back

Q5. Someone (illegally entered) the warehouse last night.

(A) broke away
(B) saw through
(C) saw into
(D) broke into

Q6. After stopping at Mumbai, the ship (traveled towards) Cuba.

(A) made to
(B) passed up
(C) went over
(D) headed for

Q7. Mr. Sahoo was (hit by a car) yesterday on his way to work.

(A) run up
(B) run through
(C) run over
(D) run out

Q8. Please (read) the instructions carefully before starting the work.

(A) watch out
(B) look up
(C) let down
(D) go over

Q9. Manoj (resembles) her mother more than her father.

(A) takes after
(B) goes after
(C) looks after
(D) calls after

Directions: Fill in the blanks with the correct alternative.

Q10. She _____ her talents at the national school of dramatics.

(A) Fine –tuned
(B) stupefied
(C) abraded
(D) downgraded
(E) turned

Q11. This troubled economy _____ violent crime.

(A) Led to wave off
(B) Waved off a trigger of
(C) Led to wave of
(D) Waved

Q12. My grandfather is very _____ about my academic performance and I was afraid that if I show him my report card, he would not _____ my abysmal performance in the final year exams.

(A) Fastidious, condone
(B) fallacious, condone
(C) Fastidious, exhume
(D) fallacious, concur

Q13. The speaker was so_____ and elaborate that the audience started getting fidgety.

(A) terse
(B) prolix
(C) curt
(D) brief

Q.14 The pentagon team _____ the crumpled chit of paper and scrutinized it, but it was written in cipher.

(A) tore out
(B) crumpled away
(C) fragmented

(D) smoothened out

Directions: Mark the choice that can replace the underlined idiom in the sentence without changing its meaning.

Q.15 The witness went into the dock and <u>got cold feet.</u>

(A) felt cold
(B) developed rheumatism
(C) was very nervous
(D) hunger pangs

Directions: Correct the underlined portion of the sentence. Choose the best alternative.

Q.16 Any country whose population is growing like India's is <u>destined to be clashing</u> with the environment sooner or later

(A) Likely to be on collision course
(B) destined to be clashing
(C) Bound to clashing
(D) bound to clash

Directions: In the questions, mark the antonym for the underlined word as your answer.

Q17. The <u>lassitude</u> of the government led to the worsening of the situation in Gujarat.

(A) alacrity
(B) lackadaisical
(C) Lachrymose
(D) laurel

Q18. The police forced found it difficult to control the <u>obstreperous</u> crowd

(A) Clamorous
(B) naughty
(C) subtle
(D) obstinate

Directions: Sentences given in each question, when properly sequenced, form a coherent paragraph. Each sentence is labeled with a letter. Choose the most logical order of sentences from among the four given choices to construct a coherent paragraph.

Q19.

A. States cannot use force expect when there is legitimate reason, but it is the state which decides whether its reasons are legitimate.

B. Even if the international community accepts the principal that intervention is justified in the event of the human rights violations, different states will have different interpretations whenever a concrete case comes up.

C. "But when you don't follow procedures, every state can simply assert that it is right ;so we have come back to the 19th century definition of international laws."

D. According to the Porf. Corten, all laws contain procedures for dealing with interpretations.

(A) ABCD
(B) BDCA
(C) BDAC
(D) CADB

Q20.

A. While it's fun and frolic for most, there is also a service motive associated with many of these.

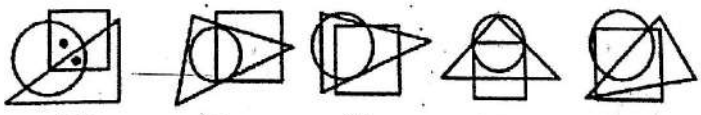
B. What very often passed as just another one of those days with schools closed and going gaga over Chacha Nehru, it has taken on the aura of a day with immense marketing potential color.

C. So, there are the messages which could be read between the lines without being too obvious.

D. With that goes TV and photo opportunities innovative shopping scheme and mega offer that would have not only the kids, but even their parents drooling.

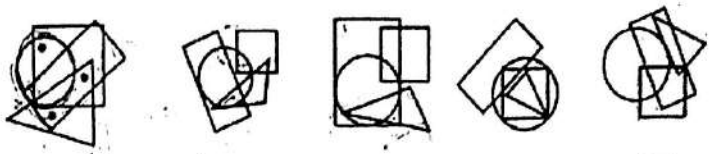
(A) BADC
(B) BDAC
(C) CBAD
(D) ABCD

Q21. Select the figure which satisfies the same conditions of placement of the dots as in Figure-X.



(A) 1
(B) 2
(C) 3
(D) 4

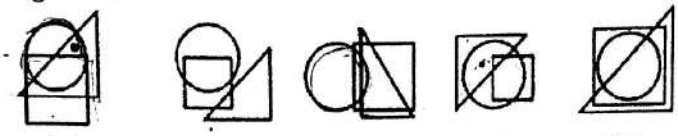
Q 22. Select the figure which satisfies the same conditions of placement of the dots as in Figure-X.



(X) (1) (2) (3) (4)

(A) 1
(B) 2
(C) 3
(D) 4

Q 23. Select the figure which satisfies the same conditions of placement of the dots as in Figure-X.



(X) (1) (2) (3) (4)

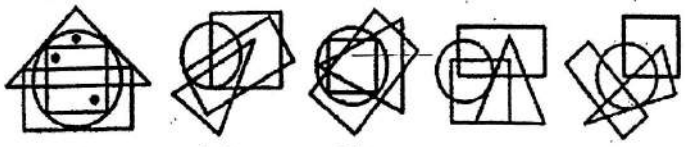
(A) 1
(B) 2
(C) 3
(D) 4

Q 24. Select the figure which satisfies the same conditions of placement of the dots as in Figure-X.

(X) (1) (2) (3) (4)

(A) 1
(B) 2
(C) 3
(D) 4

Q 25. Select the figure which satisfies the same conditions of placement of the dots as in Figure-X.

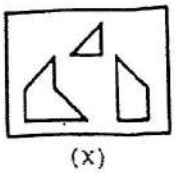


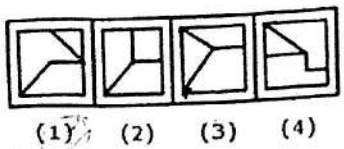
(X) (1) (2) (3) (4)

(A) 1
(B) 2

(C) 3
(D) 4

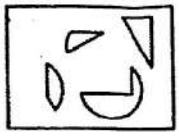
Q 26. Find out which of the figures (1), (2), (3) and (4) can be formed from the pieces given in figure (X).

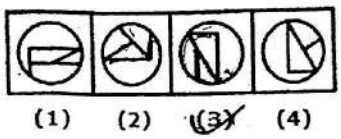

(X)


(1) (2) (3) (4)

(A) 1
(B) 2
(C) 3
(D) 4

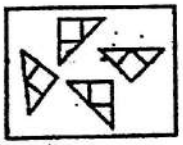
Q 27. Find out which of the figures (1), (2), (3) and (4) can be formed from the pieces given in figure (X).

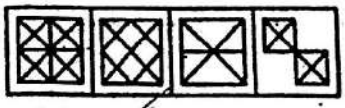

(X)


(1) (2) (3) (4)

(A) 1
(B) 2
(C) 3
(D) 4

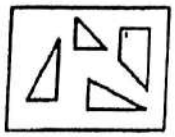
Q 28. Find out which of the figures (1), (2), (3) and (4) can be formed from the pieces given in figure (X).


(X)

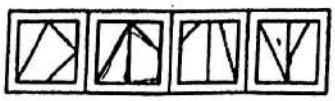

(1) (2) (3) (4)

(A) 1
(B) 2
(C) 3
(D) 4

Q 29. Find out which of the figures (1), (2), (3) and (4) can be formed from the pieces given in figure (X).



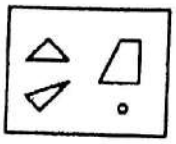
(X)



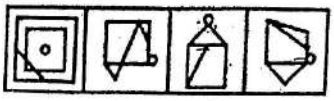
(1) (2) (3) (4)

(A) 1
(B) 2
(C) 3
(D) 4

Q 30. Find out which of the figures (1), (2), (3) and (4) can be formed from the pieces given in figure (X).



(X)



(1) (2) (3) (4)

(A) 1
(B) 2
(C) 3
(D) 4

Q 31. 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

Q 32. The inverse of matrix $\begin{bmatrix}0 & 1 & -1\\ 4 & -3 & 4\\ 3 & -3 & 4\end{bmatrix}$ is

(A) $\begin{bmatrix}4 & 1 & -1\\ 3 & -1 & 3\\ 4 & -3 & -3\end{bmatrix}$ (B) $\begin{bmatrix}0 & 1 & -1\\ 4 & -3 & 4\\ 3 & -3 & 4\end{bmatrix}$

(C) $\begin{pmatrix} 0 & -1 & 1 \\ 4 & -4 & 4 \\ 4 & 1 & -3 \end{pmatrix}$ (D) $\begin{pmatrix} 0 & -1 & 1 \\ -4 & 3 & 4 \\ 3 & -3 & 4 \end{pmatrix}$

Q 33. For the singular matrix $A = \begin{pmatrix} 1 & 2 & 3 \\ 1 & 0 & 1 \\ 3 & 4 & 7 \end{pmatrix}$, the equation $AX = 0$ has non-trivial solution

(A) $x = -1, y = 1, z = 1$
(B) $x = -1, y = 1, z = -1$
(C) $x = 1, y = -1, z = 1$
(D) $x = -1, y = -1, z = 1$

Q 34. If $f(x) = x^2 - 5x + 6$ and $A = \begin{pmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{pmatrix}$, then $f(A)$ is given by

(A) $\begin{pmatrix} 1 & 1 & -3 \\ -1 & -1 & 10 \\ -5 & 4 & 4 \end{pmatrix}$

(B) $\begin{pmatrix} 1 & -1 & -3 \\ -1 & -1 & -10 \\ -5 & 4 & -4 \end{pmatrix}$

(C) $\begin{pmatrix} 1 & -1 & -3 \\ -1 & -1 & -10 \\ 5 & 4 & -4 \end{pmatrix}$

(D) $\begin{pmatrix} 1 & -1 & -3 \\ -1 & -1 & -10 \\ -5 & 4 & -4 \end{pmatrix}$

Q 35. Let $A = \begin{pmatrix} 1 & -3 & 3 \\ 3 & -5 & 3 \\ 5 & -6 & 4 \end{pmatrix}$, then A satisfies the equation

(A) $A^3 + 12A - 16 = 0$
(B) $A^3 - 12A + 16 = 0$
(C) $A^3 - 12A - 16 = 0$
(D) $A^3 - 3A^2 + 12A - 16 = 0$

Q 36. Hermitian part of matrix $Z = \begin{pmatrix} i & i \\ -i & i \end{pmatrix}$ is given by

(A) $\frac{1}{2}\begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}$ (B) $\begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}$ (C) $\frac{1}{2}\begin{pmatrix} 0 & i \\ -i & 0 \end{pmatrix}$ (D) $\begin{pmatrix} 0 & i \\ -i & 0 \end{pmatrix}$

Q 37. The matrix $A = \begin{pmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \\ 1 & 3 & -3 \end{pmatrix}$ is a root of the equation

(A) $x^3 - x^2 + 4x - 4 = 0$
(B) $x^3 - x^2 - 4x + 4 = 0$
(C) $x^3 + x^2 + 4x - 4 = 0$
(D) $x^3 - x^2 + 4x + 4 = 0$

Q 38. If $A = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ p & q & r \end{pmatrix}$, then

(A) $A^3 + rA^2 = qA + pI$
(B) (b) $A^3 - rA^2 = qA + pI$
(C) $A^3 + qA = rA^2 + PI$
(D) $A^3 + qA = PI - rA^2$

Q 39. Residue calculated at the pole of function $f(z) = \frac{1}{z^2 \sin z}$ is

(A) $\frac{1}{3}$
(B) $\frac{2}{3}$
(C) $\frac{1}{6}$
(D) $\frac{1}{2}$

Q 40. 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) $H_0 : p > 0.5$
(A) $H_0 : p < 0.5$
(B) $H_0 : p = 0.5$
(C) $H_0 : p \neq 0.5$

Q 41. For frequency distribution, standard deviation is computed by

(A) $\sigma = \sqrt{\frac{\sum f(x-\bar{x})^2}{\sum f}}$

(B) $\sigma = \sqrt{\frac{\sum f(x-\bar{x})}{\sum f}}$

(C) $\sigma = \sqrt{\frac{\sum (x-\bar{x})^2}{\sum f}}$

(D) $\sigma = \sqrt{\frac{\sum (x-\bar{x})}{\sum f}}$

Q 42. A population consists of five numbers 2, 3, 6, 8 and 11. Consider all possible samples of size 2 that can be drawn with replacement from this population. Then, the standard deviation of the population is

(A) 6.0
(B) 10.8
(C) 3.29
(D) 5.40

Q 43. A random sample of 10 American college students reported sleeping 7, 6, 8, 4, 2, 7, 6, 7, 6, 5 hours, respectively. Then, the sample standard deviation is

(A) 1.55
(B) 1.65
(C) 1.45
(D) 1.75

Q 44. Given Cov.(X, Y) = 16.5, Var (X) = 8.25, Var (Y) = 33, then ρ (X, Y) is

(A) 1.0
(B) -1.0
(C) 1.5
(D) -1.5

Q 45. The points with position vectors $10\vec{i}+3\vec{j}$, $12\vec{i}-5\vec{j}$, and $a\vec{i}+11\vec{j}$ are collinear if a equals to

(A) -8
(B) 2
(C) 8
(D) 4

Q 46. The sum $\left|\vec{i}\times\vec{a}\right|^2+\left|\vec{j}\times\vec{a}\right|^2+\left|\vec{k}\times\vec{a}\right|^2$, with $|\vec{a}|=a$, equals to

(A) $3a^2$

(B) $6a^2$

(C) $2a^2$

(D) a^2

Q 47. If $|\vec{a}|=3, |\vec{b}|=5, |\vec{c}|=7$ and $\vec{a}+\vec{b}+\vec{c}=0$, then the angle between $\vec{a}$ and $\vec{b}$ is

(A) $\frac{\pi}{6}$

(B) $\frac{\pi}{3}$

(C) $\frac{\pi}{4}$

(D) $\frac{\pi}{2}$

Q 48. The vectors $\vec{a}=3\vec{i}-\vec{k}$, $\vec{b}=\vec{i}+2\vec{j}$ are adjacent sides of a parallelogram. Then, its area is

(A) $\sqrt{31}$

(B) $\frac{\sqrt{41}}{2}$

(C) $2\sqrt{41}$

(D) $\sqrt{41}$

Q 49. Constant forces $\vec{P}=2\vec{i}-5\vec{j}+6\vec{k}$ and $\vec{Q}=-\vec{i}+2\vec{j}-\vec{k}$ act on a particle. Then work done by the forces for a displacement from point A with position vector $4\vec{i}-3\vec{j}-2\vec{k}$ to point B with position vector $6\vec{i}+\vec{j}-3\vec{k}$ is

(A) - 15

(B) 15/2

(C) - 15/2

(D) 15

Q 50. Unit tangent vector on $\vec{r}(t) = 2\cos t\,\vec{i} + t\,\vec{j} + 2\sin t\,\vec{k}$ is given by

(A) $\frac{2}{\sqrt{5}}\sin t\,\vec{i} + \frac{1}{\sqrt{5}}\vec{j} + \frac{2}{\sqrt{5}}\cos t\,\vec{k}$

(B) $-\frac{2}{\sqrt{5}}\sin t\,\vec{i} + \frac{1}{\sqrt{5}}\vec{j} + \frac{2}{\sqrt{5}}\cos t\,\vec{k}$

(C) $\frac{2}{\sqrt{5}}\sin t\,\vec{i} + \frac{1}{\sqrt{5}}\vec{j} - \frac{2}{\sqrt{5}}\cos t\,\vec{k}$

(D) $-\frac{2}{\sqrt{5}}\sin t\,\vec{i} + \frac{1}{\sqrt{5}}\vec{j} - \frac{2}{\sqrt{5}}\cos t\,\vec{k}$

Q 51. If vectors $2\vec{i} + \lambda\vec{j} + \vec{k}$ and $4\vec{i} - 2\vec{j} - 2\vec{k}$ are perpendicular then λ is given by

(A) -1

(B) 2

(C) 3

(D) 4

Q 52. The value of λ which makes the vectors $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - 3\hat{k}$, $\vec{c} = 3\hat{i} + \lambda\hat{j} + 5\hat{k}$ coplanar is

(A) -4

(B) 4

(C) 3

(D) -3

Q 53. For $r = |\vec{r}|$ and $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, $\nabla \times \frac{\vec{r}}{r^3}$ is given by

(A) $3\frac{\vec{r}}{r^2}$

(B) $4\vec{r}$

(C) $\frac{1}{2}\vec{r}$

(D) 0

Q 54. With $r = |\vec{r}|$ and $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, grad $(\frac{1}{r})$ is given by

(A) $-\frac{\hat{r}}{r^2}$

(B) $-\frac{1}{2}\frac{\hat{r}}{r^2}$

(C) $-\frac{\hat{r}}{r}$

(D) $\frac{\hat{r}}{r}$

Q 55. The series $\sum_{n=3}^{\infty} \frac{1}{n(n+1)}$ converges to

(A) $\frac{1}{2}$

(B) $\frac{1}{3}$

(C) $\frac{3}{2}$

(D) $\frac{3}{4}$

Q 56. Let $\vec{F} = \frac{-y\hat{i}+x\hat{j}}{x^2+y^2}$, then by applying Green's theorem we get

$\int_x \vec{F}.d\vec{s}$ equals to

(A) 1

(B) π

(C) ½

(D) 0

Q 57.

$\iint_S (3x\hat{i}+2y\hat{j}).d\vec{A}$, where S is the surface of the sphere $x^2 + y^2 + z^2 = 9$ is

(A) 180π

(B) 140π

(C) 90π

(D) 45π

Q 58. A function f (x) is defined as $f(x) = \begin{cases} x^2, 0 < x < 1 \\ x, 1 \le x < 2 \\ \frac{1}{4}x^2, 2 \le x < 3 \end{cases}$, then which of the following is true

(A) f is discontinuous at x = 1
(B) f is continuous at x = 2
(C) f is discontinuous both at x = 1 and x = 2
(D) f is continuous at x = 1

Q 59. Assuming x > 0, the solution of the differential equation $\frac{dy}{dx} + \frac{y}{x} = y^2$ is

(A) $\frac{1}{y} = c\,x + x \log x$
(B) $\frac{1}{y} = -x \log x + c\,x$
(C) $\frac{1}{y} = c\,x^2 + x \log x$
(D) $\frac{1}{y} = -x \log x + c\,x^2$

Q 60. Solution of the differential equation $(e^y + 1)\cos x\,dx + e^y \sin x\,dy = 0$ is

(A) $(e^y - 1)\sin x = c$
(B) $(e^y + 1)\sin x = c$
(C) $(e^y - 1)\cos x = c$
(D) $(e^y + 1)\cos x = c$

Q 61. Solution of differential equation $\frac{dy}{dx} + \frac{x-2y}{2x-y} = 0$ is

(A) $(x - y)^3 = c\,(x + y)$
(B) $(x + y)^3 = c\,(x - y)$
(C) $(x + y)^2 = c\,(x^2 - y^2)$
(D) $(x + y)^3 = c\,(x^2 - y^2)$

Q 62. Solution of the differential equation $\frac{dy}{dx} + \frac{y}{x} = \frac{y^2}{x^2}$ is

(A) $2x + y = c\,x^2\,y$
(B) $2x = y + c\,x^2\,y$
(C) $y = 2x + c\,x^2\,y$
(D) $2y - x = c\,x^2$

Q 63. Solution of differential equation $x\frac{dy}{dx}+y=y^2\log x$ is

(A) $\frac{x}{y}=c+\frac{1}{x}(1+\log x)$

(B) $\frac{1}{xy}=c+\frac{1}{x}(1+\log x)$

(C) $y(1+\log x)+1=cxy$

(D) $\frac{1}{xy}+y(1+\log x)=c$

Q 64. Fourier transform of $e^{-|t|}$ is

(A) $\sqrt{\frac{2}{\pi}}\frac{1}{1+\omega}$

(B) $\sqrt{\frac{2}{\pi}}\frac{1}{1-\omega^2}$

(C) $\sqrt{\frac{2}{\pi}}\frac{1}{1+\omega^2}$

(D) $\sqrt{\frac{2}{\pi}}\frac{1}{1-\omega}$

Q 65. Fourier transform of $f(x) = Ne^{-\alpha x^2}$ is given by

(A) $\frac{N}{\sqrt{2\alpha}}e^{-\frac{\omega^2}{4\alpha}}$

(B) $\frac{N}{\sqrt{\alpha}}e^{-\frac{\omega^2}{4\alpha}}$

(C) $\frac{2N}{\sqrt{\alpha}}e^{-\frac{\omega^2}{4\alpha}}$

(D) $\frac{N\alpha}{\sqrt{2}}e^{-\frac{\omega^2}{4\alpha}}$

Q 66. Certain experimental values of x and y are given in the following table:

X	0	2	5	7
y	-1	5	12	20

If $y = a + b\,x$, then approximate values of a and b are

(A) a = 2.7985, b = -1.2381
(B) a = -1.1381, b = 2.8966
(C) a = 1.7854, b = -2.3214
(D) a = -1.8342, b = 2.1132

Q 67. Inverse Fourier cosine transform of $e^{-\lambda\omega}$ is given by

(A) $\sqrt{\frac{2}{\pi}}\frac{(x^2+\lambda^2)}{\lambda}$

(B) $\sqrt{\frac{2}{\pi}}\frac{\lambda}{(x^2+\lambda^2)}$

(C) $\sqrt{\frac{\pi}{2}}\frac{\lambda}{(x^2+\lambda^2)}$

(D) $\sqrt{\frac{\pi}{2}}\frac{1}{(x^2+\lambda^2)}$

Q 68. Laplace Transform of $e^{-kt}\cos t$ is

(A) $\frac{k+s}{1+(k+s)^2}$

(B) $\frac{k}{1+(k+s)^2}$

(C) $\frac{ks}{1+(k+s)^2}$

(D) $\frac{s}{1+(k+s)^2}$

Q 69. Inverse Laplace transform of $\frac{k}{a^2+s^2}$ is

(A) $\frac{k\sin at}{a}$

(B) $k\sin at$

(C) $\frac{\sin a t}{k}$

(D) $\frac{a \sin kt}{k}$

Q 70. By using Laplace transformation in solving the differential equation

$$\frac{d^2v}{dt^2} + 6\frac{dv}{dt} + 8v = 2u(t),\ v(0) = 1,\ v'(0) = -2$$

One obtains the solution v(t) as

(A) $\frac{1}{6}(1+2e^{-2t}+e^{-4t})u(t)$

(B) $\frac{1}{4}(1+e^{-2t}+2e^{-4t})u(t)$

(C) $\frac{1}{4}(1+3e^{-2t}+2e^{-4t})u(t)$

(D) $\frac{1}{4}(1+2e^{-2t}+e^{-4t})u(t)$

Q.71 A square conducting loop of side length L carries a current I. The magnetic field at the center of the loop is

(A) independent of L.

(B) proportional to L^2.

(C) inversely proportional to L.

(D) inversely proportional to L^2.

Q.72 An emf of $15V$ is applied in a circuit containing $5H$ inductance and 10Ω resistance. The ratio of the currents at time $t = \infty$ and $t = 1s$ is

(A) $\frac{e^{1/2}}{e^{1/2}-1}$ (B) $\frac{e^2}{e^2-1}$

(C) $1-e^{-1}$ (D) e^{-1}

Q.73 The magnetic moment of an electron orbiting in a circular orbit of radius r with a speed v is equal to

(A) $\frac{evr}{2}$ (B) evr

(C) $\frac{er}{2v}$ (D) $\frac{3er}{2v}$

Q.74 The forces existing between two parallel current carrying conductors is F. If the current in each conductor is doubled, then the value of force will be

(A) $2F$ (B) $4F$

(C) $3F$ (D) $5F$

Q.75 The vector potential of an infinite solenoid with n turns per unit length, radius R and current I (inside the solenoid)

(A) $\frac{\mu_0 nI}{2r}\hat{\phi}$ (B) $\frac{\mu_0 nIR^2}{2r}\hat{\phi}$

(C) $\frac{\mu_0 nIR^2}{2}\hat{\phi}$ (D) $\frac{\mu_0 nIr}{2}\hat{\phi}$

Q.76 The state of polarization of light with electric field vector

$\vec{E} = \hat{\imath}E_0 \cos(kz - \omega t) - \hat{\jmath}E_0 \cos(kz - \omega t)$

(A) linearly polarized along z-direction.

(B) linearly polarized at $-45°$ to x-axis.

(C) circularly polarized.

(D) elliptically polarized with the major axis along x-axis.

Q.77 If light is incident at the Brewester angle on a dielectric,

(A) the reflected light is completely circularly polarized.

(B) the reflected light is completely linearly polarized.

(C) the transmitted light is completely circularly polarized.

(D) the transmitted light is completely linearly polarized.

Q.78 Consider the reflection and refraction of a plane wave at a dielectric interface. Which of the following is true?

(A) The frequency of the wave does not change

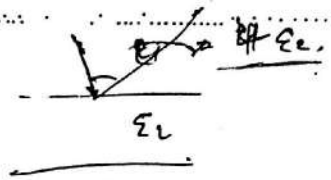
(B) The energy of the wave does not change

(C) The polarization does not change

(D) The momentum of the wave does not change

Q.79 An electromagnetic wave is to pass through a interface separating two media having dielectric constants ϵ_1 and ϵ_2 respectively. If $\epsilon_1 = 4\epsilon_2$, the wave will be totally reflected if angle of incidence is

(A) 0°
(B) 45°
(C) 30°
(D) 60°



Q.80 Guide wavelength(λ_g) , cut-off frequency (λ_c) and free-space wavelength (λ_0) of a waveguide are related as

(A) $\frac{1}{\lambda_g^2} = \frac{1}{\lambda_0^2} - \frac{1}{\lambda_c^2}$

(B) $\frac{1}{\lambda_0^2} = \frac{1}{\lambda_g^2} - \frac{1}{\lambda_c^2}$

(C) $\frac{1}{\lambda_c^2} = \frac{1}{\lambda_0^2} - \frac{1}{\lambda_g^2}$

(D) $\frac{1}{\lambda_g^2} = \frac{1}{\lambda_0^2} + \frac{1}{\lambda_c^2}$

Q.81 The dominant mode in a rectangular waveguide is TE_0, because this mode has

(A) no attenuation

(B) no cut-off

(C) no magnetic field component

(D) the highest cut-off wavelength

Q.82 Assuming perfect conductor of transmission line, pure TEM propagation is not possible in

(A) coaxial cable

(B) air filled cylindrical waveguide

(C) parallel thin wire line in air

(D) semi infinite parallel plate waveguide

Q.83 When angle of incidence is greater than Brewester angle, the reflected ray suffers a phase change of

(A) π

(B) $\frac{\pi}{2}$

(C) 2π

(D) $\frac{\pi}{4}$

Q.84 The sinusoidally time varying vector field $\vec{F} = 2\cos(\omega t + 30°)\hat{\imath} + 2\cos(\omega t - 30°)\hat{\jmath}$ is

(A) elliptically polarized

(B) circularly polarized

(C) linearly polarized

(D) unpolarized

Q.85 It is required to hold equal charges, q, in equilibrium at the corners of a square. What charge when placed at the center of the square will do this?

(A) $-\frac{q}{2}(1+2\sqrt{2})$

(B) $\frac{q}{2}(1+2\sqrt{2})$

(C) $-\frac{q}{4}(1+2\sqrt{2})$

(D) $\frac{q}{4}(1+2\sqrt{2})$

Q.86 An electron having charge e and mass m from lower plate of two metallic plates separated by a distance d. If potential difference between the plates is V, the time taken by the electron to reach the upper plate is given by

(A) $\sqrt{\frac{2md^2}{eV}}$

(B) $\sqrt{\frac{md^2}{eV}}$

(C) $\sqrt{\frac{md^2}{2eV}}$

(D) $\sqrt{\frac{md^2}{4eV}}$

Q.87 Given that a force $\vec{F}$ acts on a body for time t_1 and displaces the body by $\vec{d}$. In which of the following cases the velocity of the body must decrease?

(A) $F > d$

(B) $F < d$

(C) $F \parallel d$

(D) $\vec{F} \perp \vec{d}$

Q.88 A ball falls vertically onto a floor with momentum p, and then bounces repeatedly. If the coefficient of restitution is e then total momentum imparted by the ball on the floor is

(A) $p(1+e)$

(B) $\frac{p}{1-e}$

(C) $p\left(1+\frac{1}{e}\right)$

(D) $p\frac{1+e}{1-e}$

Q.89 A stationary body explodes into two fragments of masses m_1 and m_2. If the momentum of one segment is p, the energy of explosion is

(A) $\frac{p^2}{2(m_1+m_2)}$

(B) $\frac{p^2}{2\sqrt{m_1 m_2}}$

(C) $\frac{p^2(m_1+m_2)}{2m_1m_2}$

(D) $\frac{p^2}{2\sqrt{m_1-m_2}}$

Q.90 A particle of mass m moves under a central force field given by $\vec{F} = -\frac{K\vec{r}}{r^4}$. If E is the energy of the particle then the speed is given by

(A) $\sqrt{\frac{mr^2}{K}+\frac{2E}{m}}$

(B) $\sqrt{\frac{mr^2}{K}+\frac{E}{m}}$

(C) $\sqrt{\frac{mr}{K}+\frac{2E}{m}}$

(D) $\sqrt{\frac{K}{mr^2}+\frac{2E}{m}}$

Q.91 Einstein's mass energy relation ($E = mc^2$) shows that

(A) mass disappear to reappears as energy.

(B) mass and energy are two different forms of same entity.

(C) energy disappears to reappears as mass.

(D) all of the above.

Q.92 The velocity of light emitted by a source S observed by an observer O who is at rest with respect to S is c. If the observer moves towards S with velocity v, the velocity of light observed will be

(A) $c+v$

(B) c

(C) $c-v$

(D) $c \pm v$

Q.93 A spaceship is approaching a source of light with a speed equal to $0.5c$(c is the speed of light). Light coming from the source of light as seen by a person in the spaceship travels with speed equal to

(A) c
(B) $1.5c$
(C) $0.5c$
(D) $2.0c$

Q.94 The mass m of a moving particle is $\frac{2m_0}{\sqrt{3}}$, where m_0 is its rest mass. The linear momentum of the particle is

(A) $2m_0c$
(B) $\frac{2m_0c}{\sqrt{3}}$
(C) m_0c
(D) $\frac{m_0c}{\sqrt{3}}$

Q.95 The $p - V$ relation for a monoatomic ideal gas undergoing an adiabatic process

(A) $pV^{\frac{1}{3}}$
(B) $pV^{2/3}$
(C) $pV^{\frac{4}{3}}$
(D) $pV^{-4/3}$

Q.96 The $T - S$ diagram for a Carnot cycle is

(A) rectangle

(B) circle

(C) ellipse

(D) quadilateral type but not rectangle

Q.97 Average of squares of displacements of particles in Brownian motion is

(A) directly proportional to temperature T.

(B) directly proportional to viscosity η.

(C) directly proportional to radius of the particle a.

(D) inversely proportional to time t.

Q.98 The mean free path ,λ ,in a Maxwellian gas is given by

(A) $\lambda = \dfrac{\sqrt{2}\pi nd^2}{\eta}$

(B) $\lambda = \dfrac{1}{\sqrt{2}\pi nd^2}$

(C) $\lambda = \dfrac{\sqrt{3}\pi nd^2}{\eta}$

(D) $\lambda = \dfrac{1}{\sqrt{3}\pi nd^2}$

where symbols have their usual meaning.

Q.99 In a Young's double slit experiment with identical slits, the intensity of the central bright fringe is I_0. If one of the slit is covered, the intensity at the same point is

(A) $2I_0$

(B) I_0

(C) $\dfrac{I_0}{2}$

(D) $\dfrac{I_0}{4}$

Q.100 Two coherent sources of intensity ratio β interfere. Find the ratio $\frac{I_{max}-I_{min}}{I_{max}+I_{min}}$ in the interference pattern?

(A) $\dfrac{2\sqrt{\beta}}{1+\beta}$

(B) $\dfrac{\beta}{1+\beta}$

(C) $\dfrac{\sqrt{\beta}+1}{\sqrt{\beta}-1}$

(D) $\dfrac{\sqrt{\beta}}{1+\sqrt{\beta}}$

Q.101 To observe diffraction , the size of an aperture

(A) should be of the same order as wavelength

(B) should be much larger than the wavelength

(C) have no relation to wavelength

(D) should be exactly $\frac{\lambda}{2}$

Q.102 The main difference between the phenomena of interference and diffraction is that

(A) diffraction is caused by reflected waves from a source whereas interference is caused due to refraction of waves from a source.

(B) diffraction is due to interaction of waves derived from the same source, whereas interference is that bending of light from the same wave front.

(C) diffraction is due to interaction of light from wavefront, whereas intereference is the interaction of two waves derived from the same source.

(D) diffraction is due to interaction of light from the same wavefront whereas interference is the interaction of waves from two isolated sources.

Q.103 Find the thickness of a plate which will produce a change in optical path equal to half the wavelength λ of the light passing through it normally. The refractive index of the plate is μ.

(A) $\frac{\lambda}{4(\mu-1)}$

(B) $\frac{\lambda}{2(\mu-1)}$

(C) $\frac{\lambda}{(\mu-1)}$

(D) $\frac{2\lambda}{(\mu-1)}$

Q.104 The phenomenon of polarization of electromagnetic waves proves that the electromagnetic waves are

(A) transverse

(B) mechanical

(C) progressive

(D) logitudinal

Q.105 In the phenomenon of diffraction of light , when blue light is used in the experiment instead of red light, then

(A) fringes will become narrower

(B) fringes will becomes brader

(C) no change in fringe width

(D)fringe width becomes double

Q.106 Find the ratio of the de-broglie wavelength of proton and α-particle which has been accelerated through the same potential difference

(A) $3\sqrt{2}$
(B) $2\sqrt{2}$
(C) $2\sqrt{3}$
(D) $2\sqrt{5}$

Q.107 Out of a photon and an electron, the equation $E = pc$, is valid for

(A)both
(B) photons only
(C) electron only
(D) proton only

Q.108 Electrons with de-Broglie wavelength fall on the target in an X-ray tube. The cut-off wavelength λ_0 of the emitted X-ray is

(A) $\lambda_0 = \frac{2mc\lambda^2}{h}$
(B) $\lambda_0 = \frac{2h}{mc}$
(C) $\lambda_0 = \frac{2m^2c^2\lambda^2}{h^2}$
(D) $\lambda_0 = \lambda$

Q.109 The wave-function of a particle in a box of length L is

$$\psi(x) = \sqrt{\frac{2}{L}}\sin\frac{\pi x}{L}, \quad 0 < x < L$$

$$\psi(x) = 0, \quad x < 0 \text{and} \quad x > L$$

The probability of the particle finding in the region $0 < x < \frac{L}{2}$ is

(A) 0.4%
(B) 0.3%
(C) 0.2%
(D) 0.5%

Q.110 If the electron in an hydrogen atom jumps from an orbit with level $n_i = 3$ to an orbit with level $n_f = 2$, the emitted radiation has a wavelength given by

(A) $\lambda = \frac{R}{6}$

(B) $\lambda = \frac{5R}{36}$

(C) $\lambda = \frac{6}{R}$

(D) $\lambda = \frac{36}{5R}$

where R is the Rydeberg constant.

Q.111 If the base supply voltage increase, the Q point moves

(A) Down
(B) Up
(C) Nowhere
(D) Off the load line

Q.112 A 10 bit D/A converter provides an analog output which has a maximum value of 10.23 volts. The resolution is

(A) 10mV
(B) 20 mV
(C) 15mV
(D) 25mV

Q 113. The noise margin of a digital IC is the

(A) maximum frequency of extraneous voltage that does not cause a gate to change its state
(B) maximum extraneous voltage that does not cause a gate to change its state
(C) thermal noise voltage which causes a gate to change its state
(D) minimum frequency of extraneous voltage that causes a gate to change its state.

Q.114. If the memory chip size is 256 x 1 bits, then the number of chips required to make up 1K (1024) bytes of memory is

(A) 32
(B) 08
(C) 04
(D) 64

Q 115. The greatest negative number which can be stored in a computer that has 8 bit word length and uses 2's complement arithmetic is

(A) -256
(B) -255
(C) -128
(D) -127

Q 116 Which TTL logic family has lowest propagation delay

(A) Standard TTL
(B) Low power TTL
(C) High speed TTL
(D) Schottky TTL

Q 117. The binary equivalent of the gray code 1110 is

(A) 0001
(B) 1001
(C) 1011
(D) 0010

Q 118. The expression for sum in look ahead carry adder circuit is given by

(A) $A_i \oplus B_i$

(B) $A_i B_i$

(C) $P_i \oplus C_i$

(D) $G_i + P_i C_i$

where A_i and B_i are input bits, P_i is carry propogate and G_i is carry generated.

Q 119. The logic 0 and logic 1 levels in a RS 232 system corresponds to

(A) 0V and 5V

(B) 0V and 3-18 V

(C) -21 to -3V and 3 to 21 V

(D) -5V and 5V

Q 120. The Moore circuit output depends

(A) only on the present state of Flip Flop

(B) only on next state of Flip Flop

(C) on both present and next state of flip flop

(D) none

Q 121. Characteristics equation of T Flip Flop is

(A) $T.\overline{Q} + \overline{T}.Q$

(B) $T.Q + \overline{Q}\ \overline{T}$

(C) T.Q

(D) $\overline{T}.\overline{Q}$

Q 122. Negative logic NAND gate is equivalent to

(A) Positive logic NAND gate
(B) Positive logic NOR gate
(C) Positive logic AND gate
(D) Positive logic OR gate

Q.123 In 2's compliment notations, which of the following is the largest number?

(A) 00H
(B) 7FH
(C) 80H
(D) FFH

Q.124 Octal equivalent of 64H is

(A) 64
(B) 100
(C) 144
(D) 1100100

Q. 125. In ASCII number format, 0 is coded as

(A) 00H
(B) 10H
(C) 20H
(D) 30H

Q. 126. If number of address lines in a microprocessor is 20, then the total numbers of memory locations it can access are

(A) FFFFFH
(B) 100000H
(C) FFFFFFH
(D) 1000000H

Q. 127. Consider that a microprocessor has N bit wide data bus, all its instructions are N bit long and opcode of all the mnemonics are only 4 bit in length. If the microprocessor supports direct addressing mode, what is the size of its address bus

(A) 4 bit
(B) N / 4 bit
(C) N – 4 bit
(D) N bit

Q. 128. During memory read cycle, the status of control lines is

(A) IO/M = 0, RD = 0, WR = 1
(B) IO/M = 0, RD = 1, WR = 0
(C) IO/M = 1, RD = 0, WR = 1
(D) IO/M = 1, RD = 1, WR = 0

Q. 129. How many pins are saved by multiplexing data bus with lower order address bus in 8085 microprocessor?

(A) 0
(B) 6
(C) 7
(D) 8

Q. 130. READY pin is used to

(A) Insert wait states
(B) Start DMA cycle
(C) Interrupt the microprocessor
(D) Reset the microprocessor

Q. 131. Which one of the following is a 16-bit register in 8085 microprocessor?

(A) Stack
(B) W Register
(C) Flags
(D) Program Counter

Q. 132. Which flags are affected by CMA instruction?

(A) S, Z, P and CY
(B) AC and CY
(C) None
(D) All

Q.133. What is the state of different flags after execution of the following program?

2000H: XRA A
2001H: INR A

(A) AC = 0, CY = 0
(B) AC = 0, CY = 1
(C) AC = 1, CY = 0
(D) AC = 1, CY = 1

Q.134. What will be the contents of Register C after the execution of following program segment?

LXI SP, 3000H
LXI B, 1234H
LXI D, ABCDH
PUSH B
PUSH D
POP B
POP D

(A) 34H
(B) 12H
(C) ABH
(D) CDH

Q.135. Which one of the following is level & edge triggered interrupt

(A) TRAP
(B) RST 7.5
(C) RST 6.5 and RST 5.5
(D) INTR

Q.136. Which of the following statement is true for RAL instruction

(A) D7 bit is moved to D0 bit
(B) D7 bit is moved to Carry Flag
(C) D7 bit is moved to both Carry Flag and D0 bit
(D) D7 bit is moved to both Carry Flag and D7 bit

Q.137. How many machine cycles are there in IN 82H instruction?

(A) 1
(B) 2
(C) 3
(D) 4

Q.138. How many T-states are required to execute DAD D instruction in 8085 microprocessor?

(A) 4
(B) 6
(C) 7
(D) 10

Q.139. In opcode fetch machine cycle, what is the state of IO/M, S0 and S1 pins

(A) 1, 1, 1
(B) 0, 1, 1
(C) 0, 0, 0
(D) 0, 0, 1

Q.140. When HOLD pin is asserted, microprocessor relinquishes the control of buses after completing the current

(A) T-state
(B) Machine cycle
(C) Instruction cycle
(D) Subroutine

Q.141. Control word format to set PC1 of 8255PPI using BSR mode is

(A) 03H
(B) 80H
(C) 83H
(D) 01H

Q.142 If the emitter resistance increases, the collector voltage

(A) Decreases
(B) Stays the same
(C) Increases
(D) Breaks down the transistor

Q.143 If a transistor operates at the middle of the load line, a decrease in the base resistance will move the Q point

(A) Down
(B) Up
(C) Nowhere
(D) Off the load line

Q.144 The major advantage of a phototransistor as compared to a photodiode is its

(A) Response to higher frequencies
(B) AC operation