ANSWERKEY & SOLUTIONS

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	B	A	A	D	A	D	B	B	C	D	B	C	D	B	C	A	B	A	B	D
Q.No.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	B	D	D	A	C	A	A	A	A	D	B	B	A	C	A	B	C	B	C	D
Q.No.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	C	C	B	C	C	C	D	B	D	A	C	C	D	D	B	D	B	C	D	D
Q.No.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Ans.	A	B	A	B	D	A	C	B	D	A	B	D	D	A	B	B	C	A	A	A
Q.No.	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Ans.	B	A	D	C	B	C	A	A	A	C	C	C	A	C	D	D	D	C	C	A
Q.No.	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	D	A	A	C	B	D	B	B	D	C	A	B	B	A	D	A	A	C	A	B
Q.No.	121	122	123	124	125	126	127	128	129	130										
Ans.	D	B	D	B	A	D	C	B	A	A										

1. **Ans. (B)**

2. **Ans. (A)**

A cavity behaves somewhat like a black body, and has greater emissivity than the rest of the wood, at the same temperature.

3. **Ans. (A)**

4. **Ans. (D)**

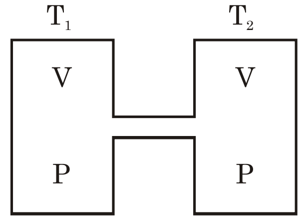
$$U = \frac{nfRT}{2} = \frac{nfN_AkT}{2}$$

$$\frac{2U}{fkT} = nN_A = N$$

5. **Ans. (A)**

6. **Ans. (D)**

7. **Ans. (B)**



$T_2 > T_1$

PV = nRT = constant

$n_1T_1 = n_2T_2$

$n_1 < n_2$

8. **Ans. (B)**

9. **Ans. (C)**

10. **Ans. (D)**

11. **Ans. (B)**

12. **Ans. (C)**

13. **Ans. (D)**

$$d = \lambda_d = \frac{h}{p} = \frac{h}{mv}$$

$$d = \frac{h}{\left[\rho \cdot \frac{4}{3}\pi\left(\frac{d}{2}\right)^3\right] \times \left(\sqrt{2gd}\right)}$$

$$d = \left(\frac{18h^2}{\pi^2\rho^2 g}\right)^{1/9}$$

14. Ans. (B)

Maximum KE of photoelectron

$$\frac{1}{2}mv_{max}^2 = \frac{hc}{\lambda} - \phi$$

$$\Rightarrow v_{max} = \sqrt{\frac{2}{m}\left(\frac{hc}{\lambda} - \phi\right)}$$

$$= \sqrt{\frac{2}{9\times10^{-31}}\left(\frac{6.6\times10^{-34}\times3\times10^{8}}{3300\times10^{-10}} - 2.5\times1.6\times10^{-19}\right)}$$

$$= \sqrt{\frac{4}{9}\times10^{12}} = \frac{2}{3}\times10^{6}\ ms^{-1}$$

Now $Bev_{max} = \frac{Mv_{max}^2}{R_{max}}$

$$\Rightarrow e = \frac{Mv_{max}}{BR_{max}} = \frac{9\times10^{-31}\times\frac{2}{3}\times10^{6}}{6.7\times10^{-6}\times0.5}$$

$= 1.8 \times 10^{-19}$C

15. Ans. (C)

From Bohr model $\frac{1}{\lambda} = R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$

$\frac{1}{\lambda_1} = R\left(\frac{1}{2^2} - \frac{1}{3^2}\right) = \frac{5}{36}R$ ...... (i) and

$\frac{1}{\lambda_2} = R\left(\frac{1}{1^2} - \frac{1}{2^2}\right) = \frac{3}{4}R$ ...... (ii)

Dividing eq. (i) and (ii), we get $\frac{\lambda_1}{\lambda_2} = \frac{27}{5}$

16. Ans. (A)

$$\sqrt{f} = (Z-b)\left(1 - \frac{1}{n^2}\right)^{1/2}$$

17. Ans. (B)

Mass of 1m^3 volume = 1000kg

from equation of continuity

$A_Q = 3A_P$

$V_Q A_Q = A_P V_P$

$V_Q 3.A_P = A_P(3)$

$V_Q = 1 m/s$

A change is in P.E = $1000\times10\times\frac{1}{2} = 5000J$

change in K.E = $\frac{1}{2}\times1000(3^2 - 1^2) = 4000J$

Net workdone by pressure = 1000J/m^3

18. Ans. (A)

19. Ans. (B)

Both capacitors are in parallel

20. Ans. (D)

$$B = \frac{\mu_0 NiR^2}{2(R^2 + x^2)^{3/2}}$$

$B_{max} \Rightarrow x_{min} = 0]$

21. Ans. (B)

22. Ans. (D)

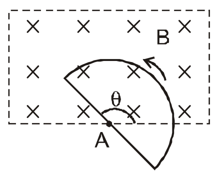
23. Ans. (D)

$E = \frac{d\phi}{dt}$, $\phi = B\pi r^2$ and $\frac{dr}{dt}$ = constant so E is constant

24. Ans. (A)

The flux through loop = $\phi = B(\frac{1}{2} r^2 \theta)$

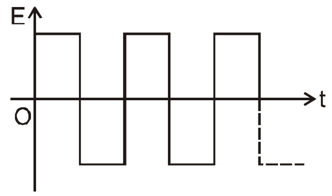
$\therefore$ Induced emf in loop = $\frac{d\phi}{dt} = \frac{1}{2}Br^2\omega$



$\because$ ω = constant, emf shall be constant in magnitude.

Since magnetic flux increases for halfcycle and decreases for the other half. Hence emf changes sign every half cycle.

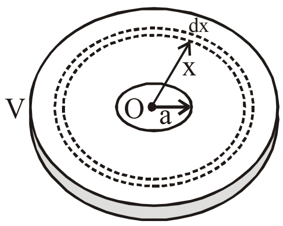
$\therefore$ The correct graph is



25. Ans. (C)

26. Ans. (A)

27. Ans. (A)



$$dR = \frac{\rho dr}{2\pi rt} \text{ (All in series)}$$

$$\therefore R = \int_a^b \frac{\rho dr}{2\pi rt} = \frac{\rho}{2\pi t} \ell n\left(\frac{b}{a}\right).$$

28. Ans. (A)

Current won't pass through

4Ω & 6Ω

$$\text{so } P = \frac{(30)^2}{3} = 300 \text{ W}$$

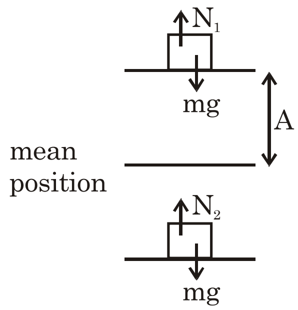
$$I = \frac{30}{3} = 10 A$$

29. Ans. (A)

$$\frac{d^2x}{dt^2} = kx \; ; \; \frac{d^2x}{dt^2} = -\omega^2 x$$

$$\omega^2 = k \; ; \; \omega = \sqrt{k} \; ; \; T = \frac{2\pi}{\omega} = \frac{2\pi}{\sqrt{k}}$$

30. Ans. (D)



$mg - N_1 = m\omega^2 A$

$N_2 - mg = m\omega^2 A$

$N_1 = mg - m\omega^2 A$

$N_2 = mg + m\omega^2 A$

$$N_1 = 600 - 60 \times 16 \times \frac{1}{10}$$

$= 536 \text{ N} \Rightarrow m = 53.6 \text{ kg}$

$N_2 = 600 + 64 = 664 \Rightarrow m = 66.4 \text{ kg}$

31. Ans. (B)

32. Ans. (B)

33. Ans. (A)

34. Ans. (C)

35. Ans. (A)

36. Ans. (B)

37. Ans. (C)

38. Ans. (B)

39. Ans. (C)

40. Ans. (D)

41. Ans.(C)

42. Ans.(C)

43. Ans.(B)

44. Ans. (C)

45. Ans.(C)

46. Ans. (C)

47. Ans.(D)

48. Ans.(B)

49. Ans. (D)

50. Ans.(A)

51. Ans.(C)

52. Ans.(C)

53. Ans. (D)

54. Ans. (D)

55. Ans. (B)

56. Ans. (D)

57. Ans. (B)

58. Ans. (C)

59. Ans. (D)

60. Ans. (D)

61. Ans. (A)

Explanation: There are few exceptions in using the comparative degree of adjectives, where 'to' is used instead of 'than'. These adjectives end with '-ior' such as: Senior, junior, superior, inferior, interior, posterior, prior. Hence Option A is the answer.

62. Ans. (B)

Explanation: Comparative degree of adjective (-er; smarter) is not used while comparing traits of the same person or thing. Instead we use more+positive degree (more smart). Hence Option B is the answer.

63. Ans. (A)

Explanation: The phrasal verb called away means to ask someone to leave a place, and called off on the other hand means to cancel or abandon. So according to the question the correct answer will be Option A.

64. Ans. (B)

Explanation: The word snarl means to say something in an angry, bad-tempered voice. In the sentence it is used as a phrasal verb; snarled on does not means anything, so snarled up will be the correct answer that means a disorganized situation such as a traffic jam.

65. Ans. (D)

Explanation: According to the given passage the correct answer to the question will be option D only.

66. Ans. (A)

Explanation: According to the given passage the correct answer to the question will be option A only.

67. Ans. (C)

Explanation: According to the given passage the correct answer to the question will be option C only.

68. Ans. (B)

Explanation: According to the given passage the correct answer to the question will be option B only.

69. Ans. (D)

Explanation: The one word used for a great work of art is Magnum Opus.

70. Ans. (A)

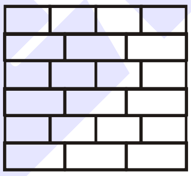
Explanation: Arrangement in option A gives meaning to the passage.

71. Ans. (B)

Explanation: The given figure contains numbers 1 to 6 in three alternate segments, the smaller number towards the outside and the numbers 14 to 19 in the remaining three alternate segments with smaller numbers towards the inside. Therefore option B is correct.

72. Ans. (D)

Explanation:



73. Ans. (D)

Explanation: The third figure in each row is the combination of the first two. Therefore option D is correct.

74. Ans. (A)

75. Ans. (B)

Explanation: The logic of the given series is as follows:

1, 13-1, 2, 23-1, 3, 33-1, 4, 43-1

Therefore option B is correct.

76. Ans. (B)

Explanation: Add up the four outer numbers and place your answer in the centre square of the shape one place clockwise. Therefore option B is correct.

77. Ans. (C)

78. Ans. (A)

79. Ans. (A)

Explanation: Except February, all other months have 31 days. Therefore option A is correct.

80. Ans. (A)

Explanation: Pragmatic is an antonym for quixotic, and clear is an antonym for murky. Therefore option A is correct.

81. Ans. (B)

82. Ans. (A)

Hence the common face with 5 dots are in the square positions. Hence 1 dot is opposite to 2 dots.

83. Ans. (D)

Position of O = 15

Position of X = 24

$\Rightarrow$ OX = 15 + 24 = 39

Hence LION = 12 + 9 + 15 + 14 = 50

84. Ans. (C)

By observation. is leap year century divisible by 400

85. Ans. (B)

No. of cubes with two surfaces painted

= No. of cubes present at the corners + no. of cubes present at 4 edges

= 8 + (n – 2) 4 = 8 + 8 = 16

86. Ans. (C)

by observation

87. Ans. (A)

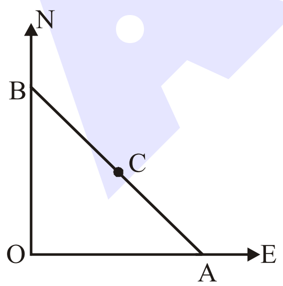
between 2 o'clock to 4 o'clock - 3 times

between 4 o'clock to 8 o'clock - 8 times

between 8 o'clock to 10 o'clock - 3 times

Total - 14 times

88. Ans. (A)



$AB = \sqrt{OB^2 + OA^2}$

$= \sqrt{(300)^2 + (400)^2} = \sqrt{250000}$

= 500 km

C being in the midway of AB, so BC = 250 km

89. Ans. (A)

4 + 9 = 13

13 + 9 = 22

22 + 13 = 35

35 + 22 = 57

90. Ans. (C)

Sanjay is new position from left is 22nd but it is the same as Rohit's earlier position which is 12th from right.

$\Rightarrow$ no. of persons in a row

= 22 + 12 - 1

= 33

91. Ans. (C)

Let $2^x = y$, then 6^{th} term is

$${}^8C_5\left(\left(y^2+5\right)^{1/3}\right)^{8-5}\left(\frac{1}{(y+1)^{1/5}}\right)^5 = 168$$

$$\Rightarrow \frac{8\times7\times6}{3!}\left(\frac{y^2+5}{y+1}\right) = 168 \Rightarrow \frac{y^2+5}{y+1} = 3$$

$\Rightarrow y^2 - 3y + 2 = 0 \quad \Rightarrow y = 1, 2$

$\Rightarrow 2^x = 1 = 2^0 \quad \Rightarrow x = 0$

$2^x = 2 = 2^1 \quad \Rightarrow x = 1$

92. Ans. (C)

Let $\vec{a} = 2x\hat{i} + x\hat{j} + z\hat{k}$

$\sqrt{5x^2 + z^2} = 5\sqrt{2}$

Also, $\cos 135° = \dfrac{z}{\sqrt{5x^2 + z^2}}$

$= \dfrac{z}{5\sqrt{2}} = -\dfrac{1}{\sqrt{2}}$

$\Rightarrow z = -5$, then $x = \sqrt{5}$,

The required vector

$\vec{a} = 2\sqrt{5}\,\hat{i} + \sqrt{5}\,\hat{j} - 5\hat{k}$

93. Ans. (A)

Common chord = diameter of second circle

$= 2\sqrt{(-1)^2 + (-2)^2 - (-11)} = 8$

then area = $\frac{\sqrt{3}}{4}(8)^2 = 16\sqrt{3}$ sq. units.

94. Ans. (C)

Cubing the equation sinx + cosecx = 2

$\Rightarrow \sin^3x + \text{cosec}^3x + 3\sin x \,\text{cosec} x(\sin x + \text{cosec} x) = 8$

$\Rightarrow \sin^3x + \text{cosec}^3x + 3(2) = 8$

$\Rightarrow \sin^3x + \text{cosec}^3x = 2$

95. Ans. (D)

Let $f'(x) = 3ax^2 - 4bx + c$

$\Rightarrow \quad f(x) = ax^3 - 2bx^2 + cx + d$

Now $f(0) = f(1)$ & $f(x)$ is continuous in [0, 1] and differentiable in (0, 1). So, by Rolle's theorem, $3ax^2 - 4bx + c = 0$ has atleast one root between 0 and 1.

96. Ans. (D)

We have $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$

$\Rightarrow (a_1 + a_{24}) + (a_5 + a_{20}) + (a_{10} + a_{15}) = 225$

$\Rightarrow 3(a_1 + a_{24}) = 225$

($\because$ in an A.P. n^{th} term from beginning + n^{th} term from end = first term + last term)

$\Rightarrow a_1 + a_{24} = 75$ ...... (1)

$\therefore a_1 + a_2 + a_3 + \ldots\ldots + a_{23} + a_{24}$

$\Rightarrow (a_1 + a_{24}) + (a_2 + a_{23}) + (a_3 + a_{22}) + \ldots\ldots + (a_{12} + a_{13})$

$\Rightarrow 12(a_1 + a_{24}) = 12.75$ from (1)

$= 900$

97. Ans. (D)

Length of tangent = length of subnormal

$\Rightarrow \quad \frac{dy}{dx} = \pm 1$

If $\frac{dy}{dx} = 1$, then equation of tangent at (3, 4) is

$y - 4 = x - 3 \Rightarrow y = x + 1$ which cuts coordinate axes at (0, 1) & (–1, 0)

If $\frac{dy}{dx} = -1$, then equation of tangent at (3, 4) is

$y - 4 = -(x - 3)$ or $x + y = 7$

which cuts positive coordinate axes at A(7, 0) and B(0, 7)

$\therefore$ Area of $\Delta OAB = \frac{1}{2}.7.7 = \frac{49}{2}$

98. Ans. (C)

If one root is 2i then other root is –2i

$\therefore$ sum of the roots = 0

$\Rightarrow \quad -B/A = 0 \Rightarrow \quad B = 0$

$\therefore \quad B^3(A^3 - C^3) = 0.$

99. Ans. (C)

Length of normal

$= y\sqrt{1 + \left(\frac{dy}{dx}\right)^2} = a(1 - \cos t)\sqrt{1 + \tan^2\frac{t}{2}}$

$= a\left(2\sin^2\frac{t}{2}\right)\left(\sec\frac{t}{2}\right) = 2a\sin^2\frac{t}{2}\sec\frac{t}{2}$

100. Ans. (A)

Since $f(x + 1) - f(x)$

$= (x + 1 + c) - (x + c) = 1$

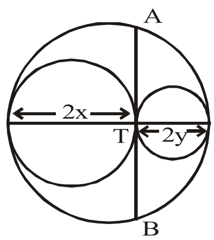
f(1), f(2), f(3), ..., f(n) is A.P.

with common difference equal to 1.

$$\sum_{x=1}^{n} f(x) = \sum_{x=1}^{n}(x + c) = \sum_{x=1}^{n} x + c\sum_{x=1}^{n} \qquad (1)$$

$$= \frac{n(n+1)}{2} + nc = \frac{n(n + 2c + 1)}{2}.$$

101. Ans. (D)



Let T is point of contact

power of point

= TA . TB = 2.2 = 2x . 2y

$\Rightarrow \quad xy = 1$

we have to find

$\pi\left[(x + y)^2 - x^2 - y^2\right] = \pi[2xy] = 2\pi$

102. Ans. (A)

If $x^2 + ax + b = 0$; $x^2 + bx + c = 0$; $x^2 + cx + a = 0$ have the roots (α, β), (β, γ) & (γ,α) respectively then

$\alpha\beta = b, \quad \beta\gamma = c, \quad \gamma\alpha = a$

$\alpha^2\beta^2\gamma^2 = abc \quad \Rightarrow \quad \alpha\beta\gamma = \pm\sqrt{abc}$

103. Ans. (A)

Let $\frac{p}{q}$ be one of the roots (where p & q are relatively prime numbers)

$\Rightarrow \quad \frac{p^3}{q^3} - \frac{3p}{q} + 1 = 0$

$\Rightarrow \quad p^3 - 3pq^2 + q^3 = 0$

$\Rightarrow \quad q^3 = p(3q^2 - p^2)$

$\Rightarrow \quad \frac{q^3}{p} = 3q^2 - p^2$

Since p & q are relatively prime numbers

$\therefore$ RHS is always an integer

$\therefore \quad p = 1$

$\Rightarrow \quad q^3 = q^2 - 1$

$\Rightarrow \quad q^2(q - 3) = -1$

$q^2 = 1$ & $q - 3 = 1$

or $\quad q^2 = -1$ & $q - 3 = 1$

$q = \pm 1 \qquad q = 4$

Not possible

$\therefore$ No value of q

Hence given equation does not have any rational root.

104. Ans. (C)

$z + \frac{1}{z} = w + \frac{1}{w}$

$\Rightarrow \quad z - w = \frac{z - w}{zw}$

$\Rightarrow \quad z = w$ or $zw = 1$ ....(i)

Similarly

$z + \frac{1}{w} = w + \frac{1}{z} \quad \Rightarrow \quad z - w = \frac{(z - w)}{-zw}$

$\Rightarrow \quad z = w$ or $zw = -1$ ....(ii)

From (i) and (ii)

$z = w$

$\Rightarrow \quad |z^2 - w^2| = 0$

105. Ans. (B)

5 cards are required for 2 clubs means in first 4 draws there is only one club and fifth drawn card is a club.

$\Rightarrow$ one card is drawn from 13 clubs, The other 3 cards are drawn from non club cards and none of them is ace of heart.

$\therefore$ The required probability

$$= \underbrace{\frac{{}^{13}C_1 \times {}^{38}C_3}{{}^{52}C_4}}_{\substack{\text{Probability of drawing} \\ \text{first 4 cards}}} \times \underbrace{\frac{{}^{12}C_1}{{}^{48}C_1}}_{\substack{\text{Probability of drawing } 5^{th} \\ \text{card, which is a club}}} \times \underbrace{\frac{1}{{}^{47}C_1}}_{\substack{\text{Probability of drawing } 6^{th} \\ \text{card, which is Ace of heart}}} = \frac{13}{188} \cdot \frac{{}^{38}C_3}{{}^{52}C_4}$$

106. Ans. (D)

$$\frac{\text{dearrangement of 5 objects}}{5!} = \frac{44}{120} = \frac{11}{30}$$

107. Ans. (B)

$$f(x) = \begin{cases} \frac{x\ell_n \cos x}{\ell_n(1 + x^2)}, & x \neq 0 \\ 0, & x = 0 \end{cases}$$

One should check the derivability at $x = 0$ only

$$f'(0) = \lim_{h \to 0} \frac{h\ \ell_n \cosh}{h\ \ell_n\left(1 + h^2\right)} = \frac{-\tanh}{2h} = -\frac{1}{2}$$

$\Rightarrow$ function is derivable at $x = 0 \Rightarrow$ A

108. Ans. (B)

109. Ans. (D)

$$\frac{1}{2}\begin{vmatrix} \lambda + 1 & 2\lambda + 1 & 2\lambda + 2 & \lambda + 1 \\ 1 & 3 & 2\lambda & 1 \end{vmatrix} = 0$$

$$\Rightarrow \frac{1}{2}\left|3\lambda + 3 - 2\lambda - 1 + 4\lambda^2 + 2\lambda - 6\lambda + 6 + 2\lambda + 2 - 2\lambda^2 - 2\lambda\right| = 0$$

$$\frac{1}{2}\left(2\lambda^2 - 3\lambda - 2\right) = 0$$

$$2\lambda^2 - 4\lambda + \lambda - 2 = 0$$

$$(2\lambda + 1)(\lambda - 2) = 0$$

$$\lambda = -\frac{1}{2}, 2$$

110. Ans. (C)

Let $x = \frac{ab}{t}$ $\Rightarrow$ $dx = -\frac{ab}{t^2}dt$

$\Rightarrow$ $I_2 = \int_a^b \frac{e^{t/a}}{\frac{ab}{t}} \cdot \frac{ab}{t^2}dt$ $\Rightarrow$ $I_2 = I_1$

111. Ans. (A)

112. Ans. (B)

$\int_1^2 e^{x^2}dx = \alpha$ $\qquad I = \int_e^{e^4} \sqrt{\ell n\, x}\; dx$

$x = e^t$ $\Rightarrow$ $dx = e^t\; dt$

$x = \int_1^4 \sqrt{t}\, e^t\; dt$ $\qquad$ put $t = y^2$

$\Rightarrow$ $x = 2\int_1^2 y^2\; e^{y^2}\; dy = 4\alpha$

I II

113. Ans. (B)

Remaining 10 persons can be distribute to 2 graphs of 6 & 4 in $\frac{10!}{4!6!}$ ways now there person can sit in $\frac{8!8!10!}{4!6!}$ ways

114. Ans. (A)

$$\sum_{r=0}^{m} = \begin{vmatrix} \Sigma(2r-1) & \Sigma\, {}^m c_r & \Sigma 1 \\ m^2-1 & 2^m & m+1 \\ \sin^2(m) & \sin^2(m) & \sin^2(m+1) \end{vmatrix}$$

$$= \begin{vmatrix} m(m+1)-(m+1) & 2^m & m+1 \\ m^2-1 & 2^m & m+1 \\ \sin^2(m) & \sin^2(m) & \sin^2(m+1) \end{vmatrix}$$

$= 0$

115. Ans. (D)

116. Ans. (A)

$$\begin{vmatrix} -1 & 2 & 1 \\ 3+2\sqrt{2} & 2+2\sqrt{2} & 1 \\ 3-2\sqrt{2} & 2-2\sqrt{2} & 1 \end{vmatrix} \qquad R_3 \to R_2 + R_3$$

$$= 2\begin{vmatrix} -1 & 2 & 1 \\ 3+2\sqrt{2} & 2+2\sqrt{2} & 1 \\ 3 & 2 & 1 \end{vmatrix} \qquad R_1 \to R_1 - R_3$$

$$= 2\begin{vmatrix} -4 & 0 & 0 \\ 3+2\sqrt{2} & 2+2\sqrt{2} & 1 \\ 3 & 2 & 1 \end{vmatrix}$$

$$= 2\left[-4\left(2+2\sqrt{2}-2\right)\right] = -16\sqrt{2}$$

absolute value $= 16\sqrt{2}$.

So, (A) is correct .

117. Ans. (A)

118. Ans. (C)

119. Ans. (A)

$f(x) = \lim_{n\to\infty} (1+x)(1+x^2)(1+x^{2^2}).....(1+x^{2^n})$

$= \lim_{n\to\infty} \frac{(1-x)(1+x)(1+x^2)(1+x^{2^2}).....(1+x^{2^n})}{(1-x)}$

$= \lim_{n\to\infty} \frac{(1-x^2)(1+x^2)(1+x^{2^2}).....(1+x^{2^n})}{(1-x)}$

$= \lim_{n\to\infty} \frac{(1-x^{2^2})(1+x^{2^2}).....(1+x^{2^n})}{(1-x)}$

Continuing in the similar manner we get,

$f(x) = \lim_{n\to\infty} \frac{(1-x^{2^n})(1+x^{2^n})}{(1-x)} = \lim_{n\to\infty} \frac{1-x^{2^{n+1}}}{1-x}$

$= \frac{1}{1-x}$

$\{\because |x| < 1 \Rightarrow x^{2^{n+1}} \to 0\}$.

120. Ans. (B)

121. Ans. (D)

Let $I = \int_0^\infty \frac{e^{-1/x^5}}{x^3\sqrt{x}}dx = \int_0^\infty \frac{e^{-1/x^5}}{x^{7/2}}dx$

Put $\frac{1}{x^5} = t^2$ or $\frac{1}{x^{5/2}} = t$

$-\frac{5}{2}x^{-7/2}dx = dt$

$\frac{1}{x^{7/2}}dx = -\frac{2}{5}dt$

$\Rightarrow \quad I = -\frac{2}{5}\int_\infty^0 e^{-t^2}dt = \frac{2}{5}\int_0^\infty e^{-t^2}dt = \frac{2\alpha}{5}$

122. Ans. (B)

123. Ans. (D)

124. Ans. (B)

$f(x) = 2^{x(x-1)}$

It is one-one onto function

$\log_2 y = x(x-1)$

$\Rightarrow \quad x^2 - x - \log_2 y = 0$

$x = \frac{1 \pm \sqrt{1+4\log_2 y}}{2}$

$f^{-1}(x) = \frac{1+\sqrt{1+4\log_2 x}}{2}$

125. Ans. (A)

$|\cot^{-1} x| = \cot^{-1} x$ (it is always +ve)

$|\tan^{-1}x| + \cot^{-1}x = \frac{\pi}{2}$

$|\tan^{-1}x| = \frac{\pi}{2} - \cot^{-1}x$

$|\tan^{-1}x| = \tan^{-1}x$

possible when $\tan^{-1}x$ is positive

$x \ge 0$

126. Ans. (D)

$(f+g)(x) = \begin{cases} 2x-1 & x \in I \\ 2x-1 & x \notin I \end{cases}$

$\Rightarrow (f+g)(x) = 2x - 1 \ \forall\ x \in R$

which is one-one onto

$\Rightarrow (f+g)^{-1}(x) = \frac{x+1}{2}$

$\Rightarrow (f+g)^{-1}(0) = \frac{1}{2}$

127. Ans. (C)

$\int x\ell nx dx + \frac{1}{2}\int x dx = \ell nx.\frac{x^2}{2} - \int \frac{1}{x}\frac{x^2}{2}dx + \frac{x^2}{4}$

$= \frac{x^2}{2}\ell nx - \frac{x^2}{4} + \frac{x^2}{4} + c = \frac{x^2}{2}\ell nx + c$

128. Ans. (B)

129. Ans. (A)

$\int x\sin\frac{1}{x}dx = \sin\frac{1}{x}.\frac{x^2}{2} - \int \frac{x^2}{2}\cos\frac{1}{x} \times -\frac{1}{x^2}dx + c$

$= \frac{x^2}{2}\sin\frac{1}{x} + \frac{1}{2}\int \cos\frac{1}{x}dx + c$

$= \frac{x^2}{2}\sin\frac{1}{x} + \frac{1}{2}\left[x\cos\frac{1}{x} - \int x.(-\sin\frac{1}{x}) \times -\frac{1}{x^2}dx\right] + c$

$= \frac{x^2}{2}\sin\frac{1}{x} + \frac{1}{2}x\cos\frac{1}{x} - \frac{1}{2}\int \frac{1}{x}\sin\frac{1}{x}dx + c$

$\Rightarrow \quad \int\left(x + \frac{1}{2x}\right)\sin\frac{1}{x}dx = \frac{x^2}{2}\sin\frac{1}{x} + \frac{1}{2}x\cos\frac{1}{x} + c$

$\Rightarrow \quad \int\left(2x + \frac{1}{x}\right)\sin\frac{1}{x}dx = x^2\sin\frac{1}{x} + x\cos\frac{1}{x} + c$

130. Ans. (A)

The coefficient is

$\frac{6!}{1!2!3!}.\ \text{cosec}\theta\ .\ \cos^2\theta\ .\ \sin^3\theta = 15\sin^2 2\theta$

$\Rightarrow$ maximum value is 15 at $\sin 2\theta = 1$