NAVY MOCK TEST ANSWER KEY

1. C — C;
2. D — D;
3. A — A;
4. D — D;
5. D — D;
6. B — B;
7. D — D;
8. B — B;
9. B — B;
10. D — D;
11. D — D;
12. C — C;
13. B — B;
14. B — B;
15. B — B;
16. B — B;
17. B — B;
18. A — A;
19. B — B;
20. A — A;
21. B — B;
22. A — A;
23. B — B;
24. B — B;
25. C — C;
26. B — B;
27. A — A; Let $\alpha = 7 + 5i$, then its conjugate $\beta = 7 - 5i$, so required equation is given by $x^2 - (\alpha + \beta)x + \alpha\beta = 0$

$\Rightarrow x^2 - (14)x + (49 + 25) = 0 \Rightarrow x^2 - 14x + 74 = 0$

28. C — C; Out of 7 places, 4 places are odd and 3 even. Therefore 3 vowels can be arranged in 3 even places in ${}^3P_3$ ways and remaining 4 consonants can be arranged in 4 odd places in ${}^4P_4$ ways.

Hence required no. of ways $= {}^3P_3 \times {}^4P_4 = 144$.

29. A — A; (i) This question can also be solved by one student
(ii) This question can be solved by two students simultaneously
(ii) This question can be solved by three students all together.

$P(A) = \frac{1}{2},\ P(B) = \frac{1}{4}, P(C) = \frac{1}{6}$

$P(A \cup B \cup C) = P(A) + P(B) + P(C)$

$-[P(A).P(B) + P(B).P(C) + P(C).P(A)] + [P(A).P(B).P(C)]$

$= \frac{1}{2} + \frac{1}{4} + \frac{1}{6} - \left[\frac{1}{2} \times \frac{1}{4} + \frac{1}{4} \times \frac{1}{6} + \frac{1}{6} \times \frac{1}{2}\right] + \left[\frac{1}{2} \times \frac{1}{4} \times \frac{1}{6}\right] = \frac{33}{48}.$

30. A — A; In the expansion of $\left(\frac{x}{2} - \frac{3}{x^2}\right)^{10}$, the general term is $T_{r+1} = {}^{10}C_r \left(\frac{x}{2}\right)^{10-r} \cdot \left(-\frac{3}{x^2}\right)^r$

$= {}^{10}C_r (-1)^r \cdot \frac{3^r}{2^{10-r}} x^{10-r-2r}$

Here, the exponent of x is $10 - 3r = 4 \Rightarrow r = 2$

$\therefore\ T_{2+1} = {}^{10}C_2 \left(\frac{x}{2}\right)^8 \left(-\frac{3}{x^2}\right)^2 = \frac{10.9}{1.2} \cdot \frac{1}{2^8} \cdot 3^2 \cdot x^4$

$= \frac{405}{256} x^4$

$\therefore$ The required coefficient $= \frac{405}{256}$.

31. B — B;

32.

33. B — B; Since limit of a function is $a+b$ as $x \to 0$, therefore to be continuous at a function, its value must be

$a+b$ at $x=0 \Rightarrow f(0)=a+b.$

34. (b) Taking , we get

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35. D — D; $f(x)=1-x^3-x^5 \Rightarrow f'(x)=-3x^2-5x^4$

$f'(x)<0$ for all values of x.

36. C — C; Put $t=1+\log x \Rightarrow dt=\frac{1}{x}dx$, then

$$\int \frac{dx}{x\sqrt{1+\log x}}=\int \frac{dt}{t^{1/2}}=2t^{1/2}+c=2(1+\log x)^{1/2}+c.$$

37. D — D; Required area $=\int_1^3 |x-2|\,dx=\int_1^2 (2-x)dx+\int_2^3 (x-2)dx$

$$=\left[2x-\frac{x^2}{2}\right]_1^2+\left[\frac{x^2}{2}-2x\right]_2^3=\frac{1}{2}+\frac{1}{2}=1.$$

38. D — D; $\frac{dy}{dx}=x\log x \Rightarrow dy=x\log x dx$

$$\Rightarrow \int dy=\int x\log x dx \Rightarrow y=\frac{x^2}{2}\log x-\frac{x^2}{4}+c.$$

39. A — A; Let the point be (x, y)

(i) Point $B(x, y)$ divides AD in $1:2$

$\therefore\ x=\frac{0+9}{3}=3$ and $y=\frac{0+12}{3}=4$

(ii) Now point $C(x, y)$ divides AD in $2:1$,

Then $x=\frac{0+18}{3}=6$ and $y=\frac{0+24}{3}=8$.

40. D — D; Radius of given circle $=\sqrt{g^2+f^2-c}$

$g^2+f^2=c$ (given), $\therefore$ Radius = 0.

41. C — C; Maximum value of $f(x)=\sqrt{3^2+4^2}=5$.

42. C — C; Period of $\cot 3x$ is $\frac{\pi}{3}$ and period of $\cos(4x+3)$ is $\frac{\pi}{2}$ $\Rightarrow$ L.C.M. is π.

43. C — C; Putting $x=a\tan^2\theta$

$$\sin^{-1}\frac{\sqrt{x}}{\sqrt{x+a}}=\sin^{-1}\frac{\sqrt{a}\sqrt{\tan^2\theta}}{\sqrt{a\tan^2\theta+a}}=\sin^{-1}\frac{\sqrt{a}\tan\theta}{\sqrt{a}\sec\theta}$$

$$=\sin^{-1}\sin\theta=\theta=\tan^{-1}\left(\sqrt{\frac{x}{a}}\right).$$

44. C — C; $\overrightarrow{AP}+\overrightarrow{PB}+\overrightarrow{PC}=\overrightarrow{PQ}$ or $\overrightarrow{AP}+\overrightarrow{PB}=\overrightarrow{PQ}+\overrightarrow{CP}$

or $\overrightarrow{AB} = \overrightarrow{CQ}$.

Hence it is a parallelogram.

45. A

A; $\lim_{x\to 0} \frac{x \cdot 2\sin^2 x}{x^2} = 2.\lim_{x\to 0}\left(\frac{\sin x}{x}\right)^2 \cdot \lim_{x\to 0} x = 0$.

46. A

A; $y = \sin^{-1}\left(\frac{19}{20}x\right) + \cos^{-1}\left(\frac{19}{20}x\right) = \frac{\pi}{2}$

$\Rightarrow \frac{dy}{dx} = 0$, $\left(\because \sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}\right)$.

47. B

B; $t = 2$ for the point (2,–1)

$\frac{dy}{dx} = \frac{4t-2}{2t+3} = \frac{6}{7}$ for $t = 2$.

48. C

C; Put $x^2 + \sin 2x + 2x = t,$ then it reduces to

$\frac{1}{2}\int \frac{1}{t}dt = \frac{1}{2}\log t + c = \frac{1}{2}\log(x^2 + \sin 2x + 2x) + c.$

49. A

A; $F[f(x)] = F(\log_a x) = a^{\log_a x} = x$

$f[F(x)] = f(a^x) = \log_a a^x = x \log_a a = x$.

50. D

D;

51. B

B; Here resistance of 40 W lamp $= \frac{V^2}{P} = \frac{(220)^2}{40\,\Omega} = 1210\,\Omega$. That of 100 W lamp is $\frac{(220)^2}{100\,\Omega} = 484\,\Omega$.

52. C

C; Falls with terminal velocity.

53. B

B;

54. C

C; Using $h = \frac{1}{2}at^2 = \frac{1}{2}\times 10 \times (4)^2$

55. C

C;

56. (d) Surface tension, spring constant and surface energy have the same units.

57. D

D;

58. C

C;

59. B

B; $\frac{mv^2}{r} = \frac{GMm}{r}$. Hence $v = \sqrt{GM}$. That is $v = \sqrt{GMr}^0$. Hence n = 0.

60. B

B; $\frac{1}{4\pi\varepsilon_0}\frac{4q\times q}{(l)^2} + \frac{1}{4\pi\varepsilon_0}\frac{Q\times q}{(l/2)^2} = 0$ This gives Q = –q

61. B

62. A

A;

63. B

B;

64. D

D; The centre of mass is symmetrically placed w.r.t. the centres of three spheres.

NAVY MOCK TEST ANSWER KEY

65. C — C; $x = \frac{\sum m_i x_i}{\sum m_i}, y = \frac{\sum m_i y_i}{\sum m_i}$

66. D — D; $\xi = \frac{LdI}{dt}$. Here $\xi = 2V$, dI = 1 A and dt = 10^{-3} s. Hence L = 2 m H.

67. C — C;

68. B — B;

69. C — C;

70. C — C; [Stress] = $ML^{-1}T^{-2}$ and [strain] = $M^0L^0T^0$

71. A — A; $\omega = \frac{v}{r} = \left(\frac{20}{50}\right) rad\, s^{-1} = 0.4 rad\, s^{-1}$

72. B — B;

73. (b) If length of side is l = 6 m then surface area of each side is 36 m2. Area of 6 faces of the cube = 6 × 36 m2 = 216 m2. Also volume of the cube = (6 m)3 = 216 m3.

74. A — A; Weight is zero during the free fall.

75. A — A; $U_k = \frac{1}{2} M\omega^2 \left(A^2 - x^2\right)$. So U_k is maximum, when x = 0.

76. B — **B;**

77. D — D;

78. D — **D;**

79. A — **A;**

80. D — D;

81. B — **B;**

82. C — **C;**

83. A — **A;**

84. D — D;

85. B — **B;**

86. D — **D;**

87. B — B;

88. B — B;

89. B — B;

90. A — A;

91. B — **B;**

92. A — **A;**

93. A — **A;**

94. A — A;

95. D — **D;**

96. C — C;

97. A — A;

98. A — A;

99. D — D;

100. B — B;