TIME: 120 Mts

EVALUATION TEST
MATHEMATICS

RW-1
MARKS: 480

1. Sets A and B have 3 and 6 elements each. What can be the minimum number of elements in $A \cup B$?
   a) 3 b) 6 c) 9 d) 18.

2. If X and Y are two sets, then $X \cap (Y \cap X)' =$
   a) X b) Y c) ϕ d) None.

3. The relation R defined on N as $\{(a,b) : a^2+b^2 \leq 16\}$ is given by.
   a) $\{(1,1), (1,2), (1,3), (1,4), (1,5)\}$ b) $\{(1,1), (1,2), (1,3), (2,3), (3,3)\}$
   c) $\{(1,1), (1,2), (2,1), (1,3), (3,1), (2,2), (2,3), (3,2)\}$ d) None.

4. A relation R is defined on the Set $A = \{a,b,c\}$ by $R = \{(a,a), (b,b), (c,c), (a,b), (b,c)\}$. Then R is
   a) reflexive b) Symmetric c) transitive d) None.

5. If $O(A) = m$ and $O(B) = n$ then the number of possible relation $\{R : A \to B\}$ is
   a) mn b) $(mn)^2$ c) 2^{m+n} d) 2^{mn}

6. If $i = \sqrt{(-1)}$; then $i^{237} =$
   a) i b) -1 c) 1 d) $-i$

7. $\sqrt{i} =$ a) -1 b) $\pm\frac{1-i}{\sqrt{2}}$ c) $\pm\frac{1+i}{\sqrt{2}}$ d) $1 \pm i$

8. $8^{1/3} =$ a) 2 b) $2, 2i, 2i^2$ c) $2, -2, 2i$ d) $2, 2\omega, 2\omega^2$

9. If ω is a complex cube root of unity, then $(2+2\omega-\omega^2)^3 - (1-\omega+\omega^2)^3 =$
   a) 9 b) 19 c) -19 d) -9

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10) $\frac{1+2i+3i^2}{1-2i+3i^2}$ = a) i b) -1 c) $-i$ d) 1

11) $1+\omega^n+\omega^{2n}=$ —, if 'n' is an integer not a multiple of 3
a) 0 b) 3 c) 1 d) ω.

12) If $z^2=(\bar{z})^2$ where z is a complex number, then
a) $z=0$ b) z is purely real c) z is purely imaginary
d) either $z=0$ or z is purely imaginary.

13) $(\cos\theta+i\sin\theta)^n=\cos n\theta+i\sin n\theta$ iff
a) n is a positive integer b) n is a negative integer
c) n is a rational number d) any of three cases (a), (b), (c).

14) The smallest positive integer, n for which $\left(\frac{1+i}{1-i}\right)^n=1$ is
a) 8 b) 4 c) 12 d) None

15) The complex number $z=x+iy$ which satisfies the equation $\left|\frac{z-5i}{z+5i}\right|=1$ lie on
a) the x-axis b) the straight line $y=5$ c) a circle passing through the origin d) None.

16) If the roots of $(3m+1)x^2+(11+m)x+9=0$ are imaginary, then
a) $m=85$ or 1 b) $m>85$ or $m<1$ c) $m<85$ and $m>1$
d) None

17) If the sum of the roots of $ax^2+2x+3a=0$ is equal to their product, then 'a' =

a) $\frac{3}{2}$ b) $\frac{2}{3}$ c) $-\frac{3}{2}$ d) $-\frac{2}{3}$

18) If $x^2+10x+21=0$ and $x^2+9x+m=0$ have one root common, then m =

a) 7 b) 21 c) 15 or 14 d) 18 or 14

19) If the roots of $2x^2+3(k-2)x+4-k=15x$ are equal in magnitude but opposite in sign, then k =

a) 4 b) 2 c) 0 d) 7

20) The maximum value of $5+4x-4x^2$ is

a) 5 b) 8 c) 6 d) None.

21) If the ratio of the roots of $ax^2+bx+c=0$ and of $px^2+qx+r=0$ is the same, then

a) $\frac{b^2}{ac}=\frac{q^2}{pr}$ b) $\frac{c}{a}=\frac{r}{p}$ c) $\frac{a}{p}=\frac{b}{q}$ d) $\frac{c}{r}=\frac{b}{q}$

22) If one root of $x^3-7x^2+19x-13=0$ is $3+i2$, the other roots are

a) $3-2i$, $2-3i$ b) $3-2i$, 1 c) 3, 2 d) -1, 13

23) If the roots of $x^4-px^3+qx^2-rx+s=0$ are $\alpha, \beta, \gamma, \delta$ then $\frac{1}{\alpha}+\frac{1}{\beta}+\frac{1}{\gamma}+\frac{1}{\delta}=$

a) p b) $-q/s$ c) r/s d) s

24) If the roots of $6x^2 - 5x + m^2 - m = 0$ are reciprocal of each other, then $m =$

a) 0 b) 1 c) 0 or 1 d) 3 or -2

25) If the roots of the equation $x^3 - 12x^2 + 39x - 28 = 0$ are in A.P, then two roots of the equation are

a) 1 and 7 b) 2 and 5 c) 3 and 8 d) None

26) The value of $\cos 15^\circ + \sin 15^\circ$ is

a) $\frac{\sqrt{3}}{\sqrt{2}}$ b) $\sqrt{3}/2$ c) $-\sqrt{3}/\sqrt{2}$ d) $\frac{1}{\sqrt{2}}$

27) The value of $\cot(\pi/4 + \theta)\cot(\pi/4 - \theta)$ is

a) 0 b) -1 c) +1 d) None

28) The greatest value of $\sin x \cos x$ is

a) 1 b) 2 c) $\sqrt{2}$ d) $\frac{1}{2}$

29) The value of $\sin^2 24^\circ - \sin^2 6^\circ$ is

a) $\frac{\sqrt{5}-1}{8}$ b) $\frac{\sqrt{5}+1}{8}$ c) $\frac{1-\sqrt{5}}{8}$ d) None

30) The value of $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ$ is

a) 1 b) 2 c) 0 d) $\frac{1}{4}$

31) If $A + B = 225^\circ$, then the value of $\frac{\cot A}{1+\cot A} \cdot \frac{\cot B}{1+\cot B}$ is

a) 1 b) $-1/2$ c) $1/2$ d) 0

32) The value of $\cos 105^\circ + \sin 105^\circ$ is

a) 1 b) $\sqrt{3}/2$ c) $1/\sqrt{2}$ d) $1/2$

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33) If $\sin^2A + \sin^2B + \sin^2C = 2$, then the triangle ABC is

a) right angled b) equilateral c) isosceles d) None

34) If $\cos\theta = \cos\alpha$, the general value of θ is

a) $2n\pi + \alpha$ b) $2n\pi - \alpha$ c) $2n\pi \pm \alpha$ d) None

35) $\tan^{-1}(\frac{1}{2}) + \tan^{-1}(\frac{1}{3}) =$

a) $\tan^{-1}(5/6)$ b) $\tan^{-1}(\frac{5}{12})$ c) $\tan^{-1}$ [illegible] d) $\tan^{-1}2$

36) The value of $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ =$

a) $\frac{1}{2}$ b) 0 c) $\sqrt{3}/2$ d) $1/\sqrt{3}$

37) If $\alpha + \beta = \pi/4$ then $(1+\tan\alpha)(1+\tan\beta) =$

a) 2 b) 1 c) 0 d) None

38) The value of $\tan[\cos^{-1}\frac{4}{5} + \tan^{-1}\frac{2}{3}]$ is

a) $\frac{6}{17}$ b) $\frac{7}{16}$ c) $\frac{16}{7}$ d) None.

38) If $\sin^{-1}(\frac{2a}{1+a^2}) + \sin^{-1}(\frac{2b}{1+b^2}) = 2\tan^{-1}x$, then $x =$

a) $\frac{a-b}{1+ab}$ b) $\frac{b}{1+ab}$ c) $\frac{b}{1-ab}$ d) $\frac{a+b}{1-ab}$

39) $\tan^{-1}(\frac{x}{y}) - \tan^{-1}(\frac{x-y}{x+y}) =$ a) $\pi/2$ b) $\pi/3$ c) $\pi/4$ d) $\frac{\pi}{4}$ or $\frac{-3\pi}{4}$

40) $\tan 5x - \tan 3x - \tan 2x =$

a) $\tan 5x \tan 3x \tan 2x$ b) $\frac{\sin 5x - \sin 3x - \sin 2x}{\cos x}$ c) 0 d) None

41) If $f(x) = \frac{x^3-8}{x^2-4}$, then $\lim_{x\to 2} f(x)$ is

a) 2 b) 4 c) 8 d) None.

42) Let $f(x) = \frac{\tan^{-1}x}{x}$. Then $\lim_{x\to 0} f(x)$ is

a) ∞ b) 1 c) 0 d) $\pi/2$

43) $\lim_{x\to 0} \frac{\sin x - x}{x^3}$ equals a) $1/3$ b) $-1/3$ c) $1/6$ d) $-1/6$

44) Let $f(x) = |x|$. Then

a) $f(x)$ is continuous for all values of x b) $f(x)$ is differential for all values of x c) $f(x)$ is not differentiable at $x=0$ d) None

45) The differential coefficient of $\sin x$ with respect to $\log x$ is

a) $\frac{\cos x}{x}$ b) $x\cos x$ c) $\frac{\sin x}{x}$ d) $x\sin x$

46) The differential coefficient of x^x is

a) $x^x \log x$ b) $x^x(1+\log x)$ c) $x^x \log(1+x)$ d) ~~$x \log x$~~ none

47) If $x = a(t-\sin t)$ and $y = a(1-\cos t)$, then $\frac{dy}{dx} =$

a) $\tan\frac{t}{2}$ b) $\cos\frac{t}{2}$ c) $\tan 2t$ d) $\cos 2t$

48) If $y = \sin^{-1}\frac{2x}{1+x^2}$, then $\frac{dy}{dx} =$

a) $1+x^2$ b) $\frac{1+x^2}{2}$ c) $\frac{2}{1+x^2}$ d) $\frac{1}{1+x^2}$

49) If $y = A\cos nx + B\sin nx$, then $\frac{d^2y}{dx^2}$ has the value

a) 0 b) y c) n^2y d) $-n^2y$

50) If $y = \tan^{-1}\left(\frac{\cos\theta}{1+\sin\theta}\right)$ then $\frac{dy}{d\theta}$ is equal to

a) $\frac{1}{2}$ b) $-1/2$ c) 1 d) -1

51) If $y = \tan^{-1}(\sec x + \tan x)$, then $\frac{dy}{dx}$ is equal to

a) 2 b) -2 c) $\frac{1}{2}$ d) $-1/2$

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2) The equation of the tangent to the curve $y = x^3 + 1$ at the point $(1,2)$ is

a) $3x - y + 1 = 0$ b) $3x + y + 1 = 0$ c) $3x + y = 1$ d) $3x - y = 1$

53) The tangent to the curve $y = f(x)$ is parallel to the x-axis at the point (x,y) if $\frac{dy}{dx}$ has the value

a) 0 b) 1 c) -1 d) ∞

54) The equation of the tangent to the curve $x^2 = 9y$, whose slope is $\frac{2}{3}$, is

a) $2x - 3y = 0$ b) $2x - 3y = 1$ c) $2x - 3y = 2$ d) $2x - 3y = 3$

55) The tangent of the curve $y = x^2 + 3x$ will pass through the point $(0,-9)$ if it is drawn at the point

a) $(0,0)$ b) $(1,4)$ c) $(-4,4)$ d) $(-3,0)$

56) The curves $y = x^2$ and $4y = 5 - x^2$ intersect at the point $(1,1)$ at the angle

a) $\pi/4$ b) $\pi/3$ c) $\pi/2$ d) None

57) The angle between the curves $y = 2x + x^2$ and $y = x - x^3$ at the origin is

a) 0 b) $\pi/4$ c) $\tan^{-1} 3$ d) $\tan^{-1} \frac{1}{3}$

58) If $f(x) = x^5 - 5x^4 + 5x^3 - 1$, then

a) $f(x)$ has a minimum at $x = 1$ b) $f(x)$ has a maximum at $x = 3$ c) $f(x)$ has neither a maximum nor minimum at $x = 0$ d) minimum value of $f(x)$ is -28

59) The maximum value of $\sin x \cos x$ is

a) 2 b) 1 c) $\frac{1}{2}$ d) None

60) Let $y = |x|$, then at $x=0$

a) $\frac{dy}{dx} = 0$ b) $\frac{dy}{dx} = -1$ c) $\frac{dy}{dx}$ does not exist d) None.

61) If $y = \sec^{-1}\left(\frac{x+1}{x-1}\right) + \sin^{-1}\left(\frac{x-1}{x+1}\right)$, then $\frac{dy}{dx} =$

a) 1 b) 0 c) $\frac{x-1}{x+1}$ d) $\frac{x+1}{x-1}$

62) The maximum value of $\frac{\log x}{x}$ is

a) 1 b) $\frac{2}{e}$ c) e d) $\frac{1}{e}$

63) A cone of maximum volume is inscribed in a given sphere, then the ratio of the height of the cone to the diameter of the sphere is

a) $\frac{2}{3}$ b) $\frac{3}{4}$ c) $\frac{1}{3}$ d) $\frac{1}{4}$

64) The differential coefficient of $\tan^{-1}\left(\frac{\sin x + \cos x}{\cos x - \sin x}\right)$ with respect to x is a) 0 b) $\frac{1}{2}$ c) 1 d) None

65) The differential coefficient of $\log \tan x$ is

a) $2\sec 2x$ b) $2\operatorname{cosec} 2x$ c) $2\sec^3 x$ d) $2\operatorname{cosec}^3 x$

66) $\int \sin^{-1} x\, dx + \int \cos^{-1} x\, dx$ is equal to

a) 0 b) $\frac{\pi}{2}$ c) $\frac{\pi x}{2}$ d) $\frac{\pi x}{2} + C$

67) $\int 3\tan^2 x \sec^2 x\, dx$ is equal to

a) $\tan^3 x$ b) $\sec^3 x$ c) $\tan x \sec^2 x$ d) $\tan^2 x \sec$

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68) $\int \frac{\log x}{x} dx =$ a) $(\log x)^2$ b) $\frac{1}{2}(\log x)^2$ c) $\log(\log x)$
d) $\frac{1}{2}\log(\log x)$

69) $\int \frac{\cos x}{1+\sin^2 x} dx$ is equal to
a) $\tan^{-1}(\sin x)$ b) $-\tan^{-1}(\sin x)$ c) $\cot^{-1}(\sin x)$
d) $-\cot^{-1}(\sin x)$

70) $\int e^x \cos x \, dx$ is equal to
a) $e^x\{\sin x - \cos x)$ b) $\frac{1}{2}e^x(\sin x - \cos x)$
c) $\frac{1}{2}e^x(\sin x + \cos x)$ d) $e^x(\sin x + \cos x)$

71) $\int_0^{\sqrt{3}} \frac{1}{1+x^2} dx =$
a) $\pi/3$ b) $\pi/4$ c) $\pi/6$ d) $\pi/12$.

72) $\int_0^1 \frac{1-x}{1+x} dx$ is equal to
a) $\log 2$ b) $2\log 2$ c) $2\log 2 - 1$ d) $2\log 2 + 1$

73) $\int_0^{\pi/2} \frac{\cos x - \sin x}{1+\sin x \cos x} dx$ is equal to
a) π b) $\pi/2$ c) $\pi/4$ d) 0.

74) $\int \frac{\sec^2 x \tan x}{\sec^2 x + \tan^2 x} dx =$ a) $\frac{1}{3}\sec^3 x$ b) $\frac{1}{3}\tan^3 x$
c) $\frac{1}{3}\log(\sec^2 x + \tan^2 x)$
d) $\frac{1}{4}\log(\sec^2 x + \tan^2 x)$

75) $\int \frac{1-\tan x}{1+\tan x}\,dx$ is equal to

a) $\log(\sin x + \cos x)$ b) $\log \sin(x + \pi/4)$

c) $\log \sec(x - \pi/4)$ d) $\log \cos(x + \pi/4)$.

76) $\int_0^{\pi/2} \log \sin x\,dx =$

a) $\pi \log 2$ b) $\frac{1}{2}\pi \log 2$ c) $2\pi \log 2$ d) $\frac{1}{2}\pi \log \frac{1}{2}$

77) $\int_0^{\pi/4} \log(1+\tan x)\,dx$ is equal to

a) $\pi \log 2$ b) $-\pi \log 2$ c) $\frac{1}{2}\pi \log 2$ d) $-\frac{1}{2}\pi \log 2$

78) $\int_0^{\pi/4} \log(1+\cos x)\,dx$ is equal to

a) $\pi \log 2$ b) $\pi/2 \log 2$ c) $\pi/4 \log 2$ d) $\pi/8\ \pi \log 2$

79) $\int_0^{\pi/4} \log(1+\cot x)\,dx =$ a) 0 b) $\pi/4$ c) $\frac{\pi}{2}$ d) π

80) $\int_0^{\pi/2} x \cot x\,dx$ is equal to

a) $\pi \log 2$ b) $\frac{1}{2}\pi \log 2$ c) $2\pi \log 2$ d) $\frac{1}{2}\pi \log \frac{1}{2}$

81) $\int_0^{\infty} \frac{\log(1+x^2)}{1+x^2} =$

a) $\pi \log 2$ b) $\frac{1}{2}\pi \log 2$ c) $2\pi \log 2$ d) $\frac{1}{2}\pi \log \frac{1}{2}$

82) $\int_0^1 \frac{\log(1+x)}{x}\,dx =$ a) $\pi^2/2$ b) $\pi^2/3$ c) $\pi^2/4$ d) $\pi^2/12$

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83) $\int_0^{\pi} \frac{x \tan x}{\sec x + \cos x} dx =$ a) $\frac{\pi^2}{4}$ b) $\frac{\pi^2}{2}$ c) $\frac{3\pi^2}{2}$ d) $\frac{\pi^2}{3}$

84) The value of $\int_0^{2\pi} \sqrt{(1+\sin\frac{x}{2})}\, dx =$

a) 0 b) 2 c) 8 d) 4.

85) The value of the integral, $\int_0^{\pi/2} \frac{\sqrt{\cot x}}{\sqrt{\cot x} + \sqrt{\tan x}} dx =$

a) $\pi/4$ b) $\pi/2$ c) π d) None.

86) $\int_{-\pi/2}^{\pi/2} \sin^2 x \cos^2 x (\sin x + \cos x) dx =$

a) $\frac{2}{15}$ b) $\frac{4}{15}$ c) $\frac{2}{5}$ d) $\frac{8}{15}$.

87) $\int_0^1 \frac{x e^x}{(x+1)^2} dx =$ a) $\frac{e}{2}$ b) $\frac{e-1}{2}$ c) $\frac{e}{2} - 1$ d) $\frac{e-3}{2}$

88) $\int \frac{dx}{1+3\sin^2 x} =$ a) $\tan^{-1}(\tan x) + C$ b) $\frac{1}{2}\tan^{-1}(2\tan x) + C$
c) $\frac{1}{3}\tan^{-1}(3\tan x) + C$ d) None

89) $\int_0^{\pi/2} \frac{(\pi/4 - x)}{\sqrt{\sin x + \cos x}}$ equals a) 0 b) $\frac{\pi}{4\sqrt{2}}$ c) $\frac{\pi\sqrt{2}}{4}$
d) None.

90) If $f(x) = \begin{cases} x+4, & x \geq 0 \\ x-4, & x < 0 \end{cases}$ then $\int_{-2}^{2} f(x) dx =$

a) 1 b) 2 c) 4 d) None.

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91) The solution of $(x+2y^3)\frac{dy}{dx} = y$ is

a) $x^2 = cy^2 + y$ b) $x^2 = cy^3 + 3y$ c) $x = y^3 + cy$

d) None.

92) The solution of $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$ is

a) $e^y = e^x + c$ b) $e^y = e^x + \frac{1}{3}x^3 + c$ c) $e^y = x^3 + c$

d) None

93) The integrating factor of the differential equation $\frac{dy}{dx} + 3x^2 y = x^5 e^{x^3}$ is

a) x^3 b) e^{x^3} c) e^{3x^2} d) None.

94) The solution of the equation $2x^2 dy = y(x+y)d$

is a) $xy^2 = c^2(x+2y)$ b) $ky = e^{\frac{y}{x}}$ c) $2y^3 - x^3 = c$

d) $(x-y)^2 = cxy^2$.

95) The solution of the equation $\frac{dy}{dx} = \frac{x+y}{x+y-2}$ is

a) $y+x = \log(y-x+1)+c$ b) $y-x = \log(x+y-1)$

c) $y-2x = \log(x+y-1)+c$ d) None.

96) If $\vec{a}$ and $\vec{b}$ are unit vectors and θ is the angle between them, then $\sin\frac{\theta}{2} =$

a) $\frac{1}{2}\vec{a}\times\vec{b}$ b) $1-\frac{1}{2}\vec{a}\cdot\vec{b}$ c) $\frac{1}{2}|\vec{a}-\vec{b}|$ d) $\frac{1}{2}|\vec{a}+\vec{b}|$

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97) The four points whose position vectors are given by $7i-4j+7k$, $i-6j+10k$, $-i-3j+4k$ are the vertices of a
a) rhombus b) parallelogram c) rectangle d) square

98) The unit vector perpendicular to both $3i+j+2k$ and $2i-2j+4k$ is
a) $i-j-k$ b) $\frac{i-j-k}{\sqrt{3}}$ c) $\frac{i+j+k}{3}$ d) $\frac{i-j+k}{\sqrt{3}}$

99) $(\vec{a}\times\vec{b})^2 =$ a) a^2b^2 b) 0 c) $a^2b^2-(\vec{a}\cdot\vec{b})^2$ d) None

100) Let $\vec{a}$ and $\vec{b}$ be unit vectors and let α be the angle between them. Then $\vec{a}+\vec{b}$ is a unit vector if a) $\alpha=\pi/2$ b) $\alpha=2\pi/3$ c) $\alpha=\pi/3$ d) $\alpha=\pi/4$

101) $\vec{A}\cdot(\vec{B}+\vec{C})\times(\vec{A}+\vec{B}+\vec{C}) =$
a) 0 b) $[\vec{A}\,\vec{B}\,\vec{C}]+[\vec{B}\,\vec{C}\,\vec{A}]$ c) $[\vec{A}\,\vec{B}\,\vec{C}]$ d) None

102) The points with position vectors $60i+3j$, $40i-8j$, $ai-52j$ are collinear if
a) $a=-40$ b) $a=40$ c) $a=20$ d) None

103) If $\vec{\alpha}=2i+3j-k$, $\vec{\beta}=-i+2j-4k$, $\vec{\gamma}=i+j+k$, then $(\vec{\alpha}\times\vec{\beta})\cdot(\vec{\alpha}\times\vec{\gamma}) =$
a) 60 b) 64 c) 74 d) -74

104) If $\vec{u}=\vec{i}\times(\vec{a}\times\vec{i})+\vec{j}\times(\vec{a}\times\vec{j})+\vec{k}\times(\vec{a}\times\vec{k})$, the value of $\vec{u}$ is
a) $\vec{a}+i+j+k$ b) $2\vec{a}$ c) $8(i+j+k)$ d) None.

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105) If $\vec{a} = 4\vec{i} + 6\vec{j}$, $\vec{b} = 3\vec{j} + 4\vec{k}$, the vector form of the component of $\vec{a}$ along $\vec{b}$ is

a) $\frac{18}{10\sqrt{13}}(3\vec{j} + 4\vec{k})$ b) $\frac{18}{25}(3j + 4k)$ c) $\frac{18}{\sqrt{13}}(3\vec{j} + 4\vec{k})$

d) $3\vec{j} + 4\vec{k}$

106) The area of the parallelogram whose diagonals are $\vec{a} = i + j - 2k$ and $\vec{b} = i - 3j + 4k$ is

a) $\sqrt{14}$ b) $2\sqrt{14}$ c) $2\sqrt{6}$ d) $\sqrt{38}$.

107) If $\vec{a}$ and $\vec{b}$ are two unit vectors then the vector $(\vec{a} + \vec{b}) \times (\vec{a} \times \vec{b})$ is parallel to the vector:

a) $\vec{a} - \vec{b}$ b) $\vec{a} + \vec{b}$ c) $2\vec{a} - \vec{b}$ d) $2\vec{a} + \vec{b}$.

108) If the vectors $ai + j + k$, $i + bj + k$ and $i + j + ck$ $(a \neq b \neq c)$ are coplanar then the value of $\frac{1}{1-a} + \frac{1}{1-b} + \frac{1}{1-c} =$ a) 1 b) 2 c) 3 d) None.

109) The force $5i + k$ is acting through the point $9i - j + 2k$. Its moment about the point $3i + 2j + k$ is

a) 11 b) $3i - j + 15k$ c) $6i - 3j + 15k$ d) $-3i - j + 15k$

110) $\vec{a} \times \vec{b} = \vec{a} \times \vec{c} \Rightarrow$ a) $\vec{b} = \vec{c}$ b) $\vec{a}$ and $\vec{b}$ are parallel

c) $\vec{a}, \vec{b}, \vec{c}$ are mutually perpendicular d) None.

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111) Let $\vec{a}$ and $\vec{b}$ be two unit vectors inclined at an angle α to each other. $|\vec{a}+\vec{b}|$ is less than 1 if
a) $\alpha < 2\pi/3$ b) $\alpha < \pi/3$ c) $\alpha > 2\pi/3$ d) $\alpha > \pi/3$.

112) If $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar vectors then
$[\vec{a}\times\vec{b}, \vec{b}\times\vec{c}, \vec{c}\times\vec{a}] =$ a) 0 b) $[\vec{a}\,\vec{b}\,\vec{c}]^2$
c) $(\vec{a}+\vec{b}+\vec{c})^2$ d) $a^2b^2c^2$.

113) $[\vec{a}+\vec{b}, \vec{b}+\vec{c}, \vec{c}+\vec{a}] =$ a) $[\vec{a}\,\vec{b}\,\vec{c}]$ b) $2[\vec{a}\,\vec{b}\,\vec{c}]$ c) 0
d) $2\vec{a}\times(\vec{b}\times\vec{c})$.

114) Let the vectors $2i+3j-4k$ and $ai+bj+ck$ be perpendicular. Then a) $a=2, b=3, c=-4$ b) $a=4, b=4, c=5$
c) $a=4, b=4, c=-5$ d) None.

115) The number of vectors of unit length perpendicular to vectors $\vec{a}=(1,1,0)$, $\vec{b}=(0,1,1)$ is
a) one b) two c) three d) infinite

116) If $\vec{a}$ and $\vec{b}$ are vectors such that $\vec{a}\cdot\vec{b}=0$ and $\vec{a}\times\vec{b}=\vec{0}$, then a) $\vec{a}$ & $\vec{b}$ are parallel b) $\vec{a}$ & $\vec{b}$ are perpendicular c) either $\vec{a}$ or $\vec{b}$ is zero d) None

117) Let $\vec{A}, \vec{B}, \vec{C}$ can be vectors of lengths 4, 4, 5 respectively. Let $\vec{A}$ be perpendicular to $\vec{B}+\vec{C}$, $\vec{B}$ to $\vec{C}+\vec{A}$ and $\vec{C}$ to $\vec{A}+\vec{B}$, then $|\vec{A}+\vec{B}+\vec{C}|$ is
a) 57 b) $\sqrt{57}$ c) 60 d) None.

118) The vector $2i+j+k$ is perpendicular to $i-4j+\lambda k$ if $\lambda =$ a) 0 b) -1 c) 2 d) -3.

119) If $|\vec{\alpha}+\vec{\beta}| = |\vec{\alpha}-\vec{\beta}|$, then

a) $|\vec{\alpha}| = |\vec{\beta}|$ b) $\vec{\alpha}$ & $\vec{\beta}$ are perpendicular

c) $\vec{\alpha}$ is parallel to $\vec{\beta}$ d) None.

120) The vector of magnitude $\sqrt{51}$ which makes equal angles with three vectors $\vec{a} = \frac{1}{3}(i-2j+2k)$, $\vec{b} = \frac{1}{5}(-4i-3k)$, $\vec{c} = j$ is

a) $5i+j+5k$ b) $\pm(5i-j-5k)$ c) $\pm(5i-j+5k)$

d) $\pm(i+5j+5k)$.

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