SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

SR MPC | **DPP TEST - 12** | **Date: 21-04-2020**

Time: 3 Hours | **Max.Marks:80 M**

MATHS-A

SYLLABUS: Matrices (Determinants & simultaneous linear equations)

1. **If** $x+iy=\begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix}$ **then**

1) $x=3, y=1$ 2) $x=1, y=3$ 3) $x=0, y=3$ 4) $x=0, y=0$

2. **If** $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}=0$ **then** $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}=$

1) 0 2) abc 3) –abc 4) 2abc

3. **If** $\begin{vmatrix} a+b & b+c & c+a \\ b+c & c+a & a+b \\ c+a & a+b & b+c \end{vmatrix}=k\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ **then k =**

1) 8 2) 2 3) 3 4) 0

4. **If** α,β,γ **are the roots of** $x^3+px+q=0$ **then** $\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix}=$

1) 0 2) p 3) q 4) p^2-2q

5. **If** $D_r=\begin{vmatrix} r & x & \frac{n(n+1)}{2} \\ 2r-1 & y & n^2 \\ 3r-1 & z & \frac{n(3n-1)}{2} \end{vmatrix}$ **then** $\sum_{r=1}^{n} D_r=$

1) 1 2) -1 3) 0 4) n

6. **If** l,m,n **are the** p^{th},q^{th},r^{th} **terms of G.P and all positive then** $\begin{vmatrix} \log l & p & 1 \\ \log m & q & 1 \\ \log n & r & 1 \end{vmatrix}=$

1) 3 2) 2 3) 1 4) 0

7. **If** $\begin{vmatrix} \cos(A+B) & -\sin(A+B) & \cos 2B \\ \sin A & \cos A & \sin B \\ -\cos A & \sin A & \cos B \end{vmatrix}=0$ **then B =**

1) $(2n+1)\frac{\pi}{2}$ 2) $n\pi$ 3) $(2n+1)\pi$ 4) $2n\pi$

8. **If** $\Delta_1=\begin{vmatrix} x & b & b \\ a & x & b \\ a & a & x \end{vmatrix}$, $\Delta_2=\begin{vmatrix} x & b \\ a & x \end{vmatrix}$ **then**

1) $\Delta_1 = 3\Delta_2^2$ 2) $\frac{d(\Delta_1)}{dx} = 3\Delta_2$ 3) $\frac{d(\Delta_1)}{dx} = 3\Delta_2^2$ 4) $\Delta_1 = 3\Delta_2^{3/2}$

9. **If** $f(x) = \begin{vmatrix} \sin^2 x & \cos^2 x & 1 \\ \cos^2 x & \sin^2 x & 1 \\ x-12 & 12 & 2 \end{vmatrix}$ **then** $f^1\left(\frac{\pi}{2}\right) =$

1) -1 2) 0 3) +1 4) ± 1

10. **A root of the equation** $\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$ **is**

1) a 2) b 3) 1 4) 0

11. **If the system of equations** $ax+y+z=0, x+by+z=0, x+y+cz=0 (a,b,c \neq 1)$ **has a non – trivial solution then** $\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c} =$

1) 1 2) -1 3) 2 4) -2

12. **The equations**
$x+y+z=6, x+2y+3z=10, x+2y+dz=\mu$ $x+y+z=6, x+2y+3z=10, x+2y+\lambda z=\mu$ **have unique solution if**

1) $\lambda=3, \mu=10$ 2) $\lambda=3, \mu\neq 10$ 3) $\lambda \neq 3$ 4) None

13. **The system of equations** $x+y+z=6$, $x+2y+3z=10$ $x+2y+\lambda z=k$ **inconsistent if** λ **= ….,** $k \neq ....$

1) 3,7 2) 3,10 3) 7, 10 4) 10, 3

14. **If** $a+b+c\neq 0$ **the system of equations** $(b+c)(y+z)-ax=b-c, (c+a)(z+x)-by=c-a,$ $(a+b)(x+y)-cz=a-b$ **have**

1) a unique solution 2) No solution
3) Infinite number of solution 4) None

15. **The number of solution of the system of equations** $2x+y-z=7$, $x-3y+2z=1,$ $x+4y-3z=5$ **is**

1) 3 2) 2 3) 1 4) 0

16. **The system of solutions** $3x-2y+z=0$, $\lambda x-14y+15z=0$ $x+2y-3z=0$ **has non zero solution then** $\lambda =$

1) 1 2) 3 3) 5 4) 0

17. **If** $x^2+y^2+z^2\neq 0$, $x=cy+bz$, $y=az+cx$, $z=bx+ay$ **then** $a^2+b^2+c^2+2abc =$

1) 0 2) 1 3) 2 4) -1

18. $A=\left[a_{ij}\right]_{mxn}$ **is a matrix of rank r then**

1) $r=\min(m,n)$ 2) $r<\min(m,n)$ 3) $r\leq\min(m,n)$ 4) None

19. **If the system of linear equations** $x+2ay+az=0$, $x+3by+bz=0$, $x+4cy+cz=0$ **has a non – zero solution, then a, b, c**

1) Are in AP 2) Are in HP 3) satisfy $a+2b+3c=0$ 4) Are in GP

20. **The number of non- trivial solutions of the system** $x-y+z=0$, $x+2y-z=0$, $2x+y+3z=0$ **is**

1) 0 2) 1 3) 2 4) 3

MATHS-B

SYLLABUS: Differentiation

21. $x = a\cos^3\theta;\ y = a\sin^3\theta$ **then** $\sqrt{1+\left(\frac{dy}{dx}\right)^2} =$

1) $\tan\theta$ 2) $\sec\theta$ 3) $\sec^2\theta$ 4) $-\tan\theta$

22. $f(x) = e^x$, $g(x) = \sin^{-1}x$ **and** $h(x) = f\left[g(x)\right]$ **then** $\frac{h^1(x)}{h(x)} =$

1) $e^{\sin^{-1}x}$ 2) $\frac{1}{\sqrt{1-x^2}}$ 3) $\sec x - \tan x$ 4) $\tan x$

23. $y = \frac{1}{2}\log\left(1+2\tan x\left(\tan x+\sec x\right)\right)$ **then** $\frac{dy}{dx} =$

1) $\sec x$ 2) $\sec x + \tan x$ 3) $\sec x - \tan x$ 4) $\tan x$

24. $\frac{d}{dx}\left[\tan^{-1}\left(\frac{a\sin x + b\cos x}{a\cos x - b\sin x}\right)\right] =$

1) 0 2) 1 3) $\frac{1}{2}$ 4) $\frac{-1}{2}$

25. **If** $e^y + xy = e$ **then** $y_2(0) =$

1) $\frac{1}{e^3}$ 2) $\frac{1}{e^2}$ 3) $\frac{1}{e}$ 4) 1

26. $f(x) = \begin{cases} \frac{\tan x}{x} & x \neq 0 \\ 1 & x = 0 \end{cases}$ **then** $f(x)$ **at** $x = 0$

1) Differentiable 2) Continuous 3) Dis continuous 4) None

27. $y = xe^{-x}$ **then** $y_2 + 2y_1 + y =$

1) 0 2) 1 3) -1 4) 2

28. **If** $f(x) = \frac{1+\tan x}{1-\tan x}$ **then** $f^1(x) =$

1) $\sec^2\left(\frac{\pi}{4}+x\right)$ 2) $\sec^2\left(\frac{\pi}{4}-x\right)$ 3) $-\sec^2\left(\frac{\pi}{4}-x\right)$ 4) $\tan x$

29. **If 'g' is the inverse of function f and** $f^1(x) = \frac{1}{1+x^5}$ **then** $g^1(x) =$ **is equal to**

1) $\frac{1}{1+\left\{g(x)\right\}^5}$ 2) $\frac{1}{1+f(x)}$ 3) $1+\left\{g(x)\right\}^5$ 4) None

30. **If** $y = a\cos(\log x) + b\sin(\log x)$ **then** $x^2y_2 + xy_1 =$

1) 0 2) y 3) 2y 4) –y

31. $\frac{d^2x}{dy^2}$ **equals:**

1) $\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-2}$ 2) $-\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-3}$ 3) $-\left(\frac{d^2y}{dx^2}\right)^{-1}$ 4) $-\left(\frac{d^2y}{dx^2}\right)^{-1}\left(\frac{dy}{dx}\right)^{-3}$

32. $f(x) = 10\cos x + (13+2x)\sin x \Rightarrow f^{11}(x) + f(x) =$

1) $\cos x$ 2) $4\cos x$ 3) $\sin x$ 4) $4\sin x$

33. **The derivative of** $\log_{10}^{x}$ w.r.t x^2 **is**

1) $\frac{1}{2x\log 10}$ 2) $\frac{1}{2x^2\log 10}$ 3) $\frac{-1}{2x\log 10}$ 4) $\frac{-1}{2x^2\log 10}$

34. The derivative of $\tan^{-1}(\sec x+\tan x)$ w.r.t x

1) 0 2) $\frac{-1}{2}$ 3) $\frac{1}{2}$ 4) None

35. If $y=x+\tan x$ then $\cos^2 x\frac{d^2y}{dx^2}+2x=$

1) $2y$ 2) $-2y$ 3) y 4) –y

36. If $y=\tan^{-1}\left(\frac{\log ex^{-2}}{\log ex^2}\right)+\tan^{-1}\left(\frac{3+2\log x}{1-6\log x}\right)$ then $\frac{d^2y}{dx^2}$

1) 1 2) -1 3) 0 4) None

37. If $x=a(\cos t+t\sin t):y=a(\sin t-t\cos t)$ then $\sqrt{\left(\frac{dx}{dt}\right)^2+\left(\frac{dy}{dt}\right)^2}=$

1) at 2) at^2 3) a^2t^2 4) a^2t

38. If 'f' is an even function and $f^1(x)$ exists then $f^1(0)=$

1) 1 2) -1 3) 0 4) $f(0)$

39. $\frac{d}{dx}\log\left(\tan\left(\tan^{-1}\sinh x\right)\right)=$

1) $\sinh 2x$ 2) cot h x 3) cot h $2x$ 4) $\sinh x$

40. $\sin y=x\sin(a+y)$ then $\frac{dy}{dx}=$

1) $\frac{\sin a}{\sin^2(a+y)}$ 2) $\frac{\sin^2(a-y)}{\sin a}$ 3) $\frac{\sin^2(a+y)}{\sin a}$ 4) $\sin a\sin^2(a+y)$

PHYSICS

SYLLABUS: Mechanical properties of solids, fluid statics

41. A body subjected to strain several times will not obey Hook's law due to

1) Yield point 2) Permanent stage 3) Elastic fatigue 4) Breaking stress

42. When a wire is subjected to a force along it's length increases by 0.4% and its radius decreases by 0.2%. Then the poison's ratio of the material of the wire is

1) 0.8 2) 0.5 3) 0.2 4) 0.1

43. If 'S' is stress and 'Y' young modulus of material of a wire, the energy stored in the wire per unit volume is

1) $\frac{S^2}{2Y}$ 2) $\frac{2Y}{S^2}$ 3) $\frac{2Y}{S^3}$ 4) $2S^2Y$

44. An elongation of 0.1% in a wire of cross section area $10^{-6}m^2$ causes a tension of 100N. Y wire is

1) $10^{12}N/m^2$ 2) $10^{11}N/m^2$ 3) $10^{10}N/m^2$ 4) $100N/m^2$

45. The increase in pressure required to decrease the 200 litres volume of a liquid by 0.004% in KPa is (Bulk modulus of the liquid = 2100 MPa)

1) 8.4 2) 84 3) 92.4 4) 168

46. The elongation of a spring of length 'L' and of negligible mass due to a force is 'x'. The spring is cut into two places of length in the ratio 1:n. The ratio of the respective spring constant is

1) n : 1 2) 1 : n 3) $n^2:1$ 4) $1:n^2$

47. When a tension F is applied, the elongation produced in uniform wire of length 'L', radius 'r' is 'e'. When tension 2F is applied, the elongation produced in another uniform wire of length '2L' and radius '2r' made of same material is

1) 0.5e 2) 1.0e 3) 1.5e 4) 2.0e

48. When a force F_1 is applied on a metallic wire, the length of the wire is L_1, If a force F_2 is applied on the same wire, the length of the wire is L_2. The original length of the wire L is

1) $\frac{L_1F_1+L_2F_2}{F_1+F_2}$ 2) $\frac{L_2-L_1}{F_1+F_2}$ 3) $\frac{F_1L_2-F_2L_1}{F_1-F_2}$ 4) $\frac{F_2L_2-F_2L_2}{F_1-F_2}$

49. The pressure that has to be applied to the ends of a steel wire of length 10cm to keep its length constant when its temperature is raised by 100^0C is (for steel $y=2\times10^{11}N/m^2$, $\alpha=1.1\times10^{-5}k^{-1}$)

1) 2.2×10^8Pa 2) 2.2×10^9Pa 3) 2.2×10^7Pa 4) 2.2×10^6Pa

50. A tension of 20N applied to a copper wire of cross sectional area $0.01cm^2$, young's modulus of copper is $1.1\times10^{11}N/m^2$ and poisson's ratio 0.32 . The decrease in cross sectional area of the wire is

1) $1.16\times10^{-6}cm^2$ 2) $1.16\times10^{-5}m^2$ 3) $1.16\times10^{-4}m^2$ 4) $1.16\times10^{-3}cm^2$

51. Young's modulus of metal is $15\times10^{11}Pa$. If its poisson's ratio is 0.4. The metal in Pa is

1) 25×10^{11} 2) 2.5×10^{11} 3) 250×10^{11} 4) 0.25×10^{11}

52. Two blocks of masses 1 kg and 2kg are connected by a metal wire going over a smooth pulley. The breaking stress of metal wire going over a smooth pulley. The breaking stress of metal is $\frac{40}{3\pi}10^6N/m^2$. What should be the minimum radius of wire used if it should not break? $\left(g=10m/s^2\right)$

1) 0.5mm 2) 1mm 3)1.5mm 4) 2mm

53. The length of a wire under stress changes by 0.01%. The strain produced is

1) 1×10^{-4} 2) 0.01 3) 1 4) 4×10^4

54. A wire elongates by 1mm when a load w is hanged from it. If the wire goes over a pulley and two weight w each are hung at the two ends, the elongation of the wire will be (in mm)

1) Zero 2) $\frac{l}{2}$ 3) l 4) $2l$

55. A wire fixed at the upper end stretches by length l by applying a force F. The work done in stretching is

1) $\frac{F}{2l}$ 2) Fl 3) $2Fl$ 4) $\frac{Fl}{2}$

56. In a stationary homogeneous liquid

1) Pressure is the same at all points
2) Pressure dependents the direction
3) Pressure is independent of any atmospheric pressure on the upper surface of the liquid
4) Pressure is the same at all points at the same level

57. A water filled cylinder of height 50cm and base area $20cm^2$ is placed on a table with the base on the table. The trust offered by water on the table is

1) 98N 2) 49N 3) 9.8N 4) 4.9N

58. If S_1 is the specific gravity of a solid with respect to a liquid and S_2 is the specific gravity of the liquid with respect to water, then the specific gravity of the solid with respect to water is

1) S_1+S_2 2) $S_1\times S_2$ 3) S_1-S_2 4) $\frac{S_1}{S_2}$

59. A cube of side is floating on a liquid with 5cm of the cube outside. If the density of liquid is 0.8gm/cc then the mass of the cube is

1) 4.2 kg 2) 4.8kg 3) 5kg 4) 5.2kg

60. If a body floats with $\left(\frac{m}{n}\right)^{th}$ of its volume above the surface of water, then the relative density of the material of the body is

1) $\left(\frac{n-m}{n}\right)$ 2) $\frac{m}{n}$ 3) $\frac{n}{m}$ 4) $\frac{n-m}{m}$

CHEMISTRY

SYLLABUS: P – Block: 13th Group, Environmental Chemistry

61. The among stability of +1 oxidation state among $Al, Ga, In,$ and Tl increases in the sequence

1) $Al < Ga < In < Tl$ 2) $Tl < In < Ga < Al$ 3) $In < Tl < Ga < Al$ 4) $Ga < In < Al < Tl$

62. The pair of amphoteric hydroxides is

1) $Be(OH)_2, Al(OH)_3$ 2) $Al(OH)_3, LiOH$

3) $B(OH)_3, Be(OH)_2$ 4) $Be(OH)_2, Mg(OH)_2$

63. When CO_2 is passed through solution of sodium aluminate precipitate of which compound is formed

1) $Al(OH)_3$ 2) Al_2O_3 3) Na_2CO_3 4) No ppt

64. Which of the following exists in gaseous from in nature?

1) ClF_3 2) BF_3 3) IF_3 4) ICl

65. The correct order of decreasing Lewis acidity is

1) $BF_3 > BCl_3 > BBr_3 > BI_3$ 2) $BI_3 > BCl_3 > BBr_3 > BF_3$

3) $BI_3 > BBr_3 > BCl_3 > BF_3$ 4) $BCl_3 > BF_3 > BBr_3 > BI_3$

66. The strongest Lewis acid among Boron halides is

1) BBr_3 2) BCl_3 3) BI_3 4) BF_3

67. Which of the following is correct?

1) BF_3 is a strong Lewis base 2) BF_3 is strong Lewis acid

3) BF_3 is not hydrolysed 4) BF_3 is an electrolyte

68. Boric acid is an acid because its molecule

1) Contains replaceable $H^{\oplus}$ ion
2) Give up a proton
3) Accepts $OH^{\odot}$ from water releasing proton
4) Combines with proton from water molecule

69. Which of the following structures is similar to graphite?

1) B_4C 2) B_2H_6 3) BN 4) B

70. Indiborane the number of electro MS that account for bonding in the bridges is

1) Six 2) Two 3) Eight 4) four

71. The product/s formed when diborane is hydrolysed is /are

1) B_2O_3 and H_3BO_3 2) B_2O_3 only 3) H_3BO_3 and H_2 4) H_3BO_3 only

72. Which of the following molecular hydrides acts as a Lewis acid

1) NH_3 2) H_2O 3) B_2H_6 4) CH_4

73. $B(OH)_3$ is a

1) Lewis acid 2) Lewis base 3) Bronsted base 4) Bronsted acid

74. An aqueous solution of borax is

1) Neutral 2) Acidic 3) Basic 4) Amphoteric

75. Which of the following is a sink for CO?

1) Microorganisms present in the soil 2) Oceans
3) Plants 4) None of these

76. Which of the following has highest concentration of PAN?

1) Smoke 2) Ozone 3) Photochemical smog 4) Reducing smog

77. Among the following the one which is not a greenhouse gas is

1) N_2O 2) CO_2 3) CH_4 4) O_2

78. The secondary precursors of photo chemical smog are

1) SO_2 and NO_2 2) SO_2 and hydrocarbons

3) NO_2 and PAN 4) O_3 and PAN

79. Which of the following statements is not correct?

1) "CO" is the main air pollutant 2) All pollutants are not wastes

3) Water is pollutant if B.O.D is less 4) lichens are pollution indicators

80. Excess Nitrate in drinking water can cause

1) Methemoglobinemia 2) Kidney damage

3) Liver damage 4) laxative effect

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INDIA

SR MPC | **DPP TEST - 12** | **Date: 21-04-2020**

Time: 3 Hours | **Max.Marks:80 M**

KEY SHEET

MATHS - A

1) **4** 2) **2** 3) **2** 4) **1** 5) **3** 6) **4** 7) **1** 8) **2** 9) **1** 10) **4**

11) **1** 12) **3** 13) **2** 14) **1** 15) **4** 16) **3** 17) **2** 18) **1** 19) **2** 20) **1**

MATHS – B

21) **2** 22) **2** 23) **1** 24) **2** 25) **2** 26) **2** 27) **1** 28) **1** 29) **3** 30) **4**

31) **2** 32) **2** 33) **2** 34) **3** 35) **1** 36) **3** 37) **1** 38) **3** 39) **2** 40) **3**

PHYSICS

41) **3** 42) **2** 43) **3** 44) **2** 45) **2** 46) **1** 47) **1** 48) **3** 49) **2** 50) **1**

51) **1** 52) **3** 53) **1** 54) **3** 55) **4** 56) **4** 57) **3** 58) **2** 59) **2** 60) **1**

CHEMISTRY

61) **1** 62) **1** 63) **1** 64) **2** 65) **3** 66) **3** 67) **3** 68) **3** 69) **3** 70) **4**

71) **3** 72) **3** 73) **1** 74) **3** 75) **1** 76) **4** 77) **4** 78) **4** 79) **3** 80) **1**

HINTS & SOLUTIONS

MATHS- A

1. $x+iy=\begin{vmatrix}6i & -3i & 1\\ 4 & 3i & -1\\ 20 & 3 & i\end{vmatrix}\ i^2=-1$

$=6i\left(3i^2+3\right)+3i\left(4i+20\right)+1\left(12-60i\right)$

$=6i\left(-3+3\right)+12i^2+60i+12-60i$

$x+iy=0+0$

$x=0,\ \ y=0$

2. $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}=0$

$\begin{vmatrix}1+a & 1 & 1\\ 1 & 1+b & 1\\ 1 & 1 & 1+c\end{vmatrix}$

$R_1\to R_1-R_2,\ \ R_2\to R_2-R_3$

$=\begin{vmatrix}a & -b & 0\\ 0 & b & -c\\ 1 & 1 & 1+c\end{vmatrix}$

$=ab+abc+ac+bc$

$=abc\left(\frac{1}{c}+1+\frac{1}{b}+\frac{1}{a}\right)$

$=abc\left(0+1\right)\ =abc$

3. Put $a=b=c=1$ then

$k=2$

4. $x^3+px+q=0$, roots α,β,γ

$\alpha+\beta+\gamma=0$, $\alpha\beta+\beta\gamma+\gamma\alpha=p, \alpha\beta\gamma=-q$

$\begin{vmatrix}\alpha & \beta & \gamma\\ \beta & \gamma & \alpha\\ \gamma & \alpha & \beta\end{vmatrix}=\alpha\left(\beta\gamma-\alpha^2\right)-\beta\left(\beta^2-\alpha\gamma\right)+\gamma\left(\alpha\beta-\gamma^2\right)$

$=\alpha\beta\gamma-\alpha^3-\beta^3+\alpha\beta\gamma+\alpha\beta\gamma-\gamma^3$

$=3\alpha\beta\gamma-\alpha^3-\beta^3-\gamma^3$

$=3\alpha\beta\gamma-3\alpha\beta\gamma$

$=0$

5.

$Dr=\begin{vmatrix}r & x & \frac{n\left(n+1\right)}{2}\\ 2r-1 & y & n^2\\ 3r-1 & z & \frac{n\left(3n-1\right)}{2}\end{vmatrix}$

$\sum_{r=1}^{n}Dr=\begin{vmatrix}r & x & r\\ 2r-1 & y & 2r-1\\ 3r-1 & z & 3r-1\end{vmatrix}=0$

6. l,m,n are p^{th},q^{th},r^{th} terms of GP

$$\begin{vmatrix}\log l & p & 1\\ \log m & q & 1\\ \log n & r & 1\end{vmatrix}$$

$$=\begin{vmatrix}p-1 & p & 1\\ q-1 & q & 1\\ r-1 & r & 1\end{vmatrix}$$

$c_2 \to c_2 - c_3$

$$=\begin{vmatrix}p-1 & p-1 & 1\\ q-1 & q-1 & 1\\ r-1 & r-1 & 1\end{vmatrix}$$

$=0$

7. $$\begin{vmatrix}\cos(A+B) & -\sin(A+B) & \cos 2B\\ \sin A & \cos A & \sin B\\ -\cos A & \sin A & \cos B\end{vmatrix}=0$$

$$\cos(A+B)(\cos A\cos B-\sin A\sin B)+\sin(A+B)(\sin A\cos B+\cos A\sin B)+\cos 2B(\sin^2 A+\cos^2 A)=0$$

$$\cos^2(A+B)+\sin^2(A+B)+\cos 2B=0$$

$$1+\cos 2B=0$$

$$\cos 2B=-1$$

$$2B=\pi$$

$$2B=2n\pi\pm\pi$$

$$B=\frac{2n\pi}{2}\pm\frac{\pi}{2}$$

$$B=\frac{2n\pi}{2}+\frac{\pi}{2}=(2n+1)\frac{\pi}{2}$$

8. $$\Delta_1=\begin{vmatrix}x & b & b\\ a & x & b\\ a & a & x\end{vmatrix}$$

$$=x(x^2-ab)-b(ax-ab)+b(a^2-ax)$$

$$\Delta_1=x^3-3abx+ab^2+a^2b$$

$$\frac{d(\Delta_1)}{dx}=3x^2-3ab=3(x^2-ab)=3(\Delta_2)$$

$$\Delta_2=\begin{vmatrix}a & b\\ a & x\end{vmatrix}=x^2-ab$$

$$\therefore\frac{a(\Delta_1)}{dx}=3\Delta_2$$

9. $$f(x)=\begin{vmatrix}\sin^2 x & \cos^2 x & 1\\ \cos^2 x & \sin^2 & 1\\ x-12 & 12 & 2\end{vmatrix}$$

$R_1 \to R_1+R_2$

$$= \begin{vmatrix} 1 & 1 & 2 \\ \cos^2 x & \sin^2 x & 1 \\ x-12 & 12 & 2 \end{vmatrix}$$

Simplified and put $x = \frac{\pi}{2}$

$\therefore f^1(x) = -1$

10. $\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$

$(x-a)(x+b)(x-c)+(x+a)(x-b)(x+c)=0$

Put $x=0$, it's satisfied the root $x=0$

11. $ax+y+z=0$, $x+by+z=0$, $x+y+cz=0$ non – trivial solution

$$\begin{vmatrix} a & 1 & 1 \\ 1 & b & 1 \\ 1 & 1 & c \end{vmatrix} = 0$$

$R_1 \to R_1 - R_2$

$$\begin{vmatrix} a-1 & 1-b & 1-c \\ 1 & b & 1 \\ 1 & 1 & c \end{vmatrix} = 0$$

after simplification

$$\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}=1$$

12. Augmented matrix $(AB) = \begin{bmatrix} 1 & 1 & 1 & 6 \\ 1 & 2 & 3 & 10 \\ 1 & 2 & \lambda & \mu \end{bmatrix}$

$R_2 \to R_2 - R_1$, $R_3 \to R_3 - R_1$

$$= \begin{bmatrix} 1 & 1 & 1 & 6 \\ 0 & 1 & 2 & 4 \\ 0 & 1 & \lambda-1 & \mu-6 \end{bmatrix}$$

$R_3 \to R_2 - R_3$

$$= \begin{bmatrix} 1 & 1 & 1 & 6 \\ 0 & 0 & 3-\lambda & 10-\mu \\ 0 & 1 & \lambda-1 & \mu-6 \end{bmatrix}$$

Unique solution $3-\lambda \neq 0$

$\lambda \neq 3$

13. Augmented matrix $(AB) = \begin{bmatrix} 1 & 1 & 1 & 6 \\ 1 & 2 & 3 & 10 \\ 1 & 2 & \lambda & k \end{bmatrix}$

$R_2 \to R_2 - R_1$, $R_3 \to R_3 - R_1$

$$= \begin{bmatrix} 1 & 1 & 1 & 6 \\ 0 & 1 & 2 & 4 \\ 0 & 1 & \lambda-1 & K-6 \end{bmatrix}$$

$R_2 \to R_2 - R_3$

$$= \begin{bmatrix} 1 & 1 & 1 & 6 \\ 0 & 0 & 3-\lambda & 10-K \\ 0 & 1 & \lambda-1 & K-6 \end{bmatrix}$$

In consistent solution $3-\lambda=0$, $10-K=0$

$\lambda=3,\ K=10$

14. $a+b+c \neq 0$

$(b+c)(y+z)-ax=b-c$

$(c+a)(z+x)-by=c-a$

$(a+b)(x+y)-cz=a-b$

System of solution $\Delta \neq 0$

It's unique solution

15. The system of equation's $2x+y-z=7,\ x-3y+2z=1,\ x+4y-3z=5$

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

No of solution , no of solutions = 0

16. Non – zero solution

$$\begin{vmatrix} 3 & -2 & 1 \\ \lambda & -14 & 15 \\ 1 & 2 & -3 \end{vmatrix} = 0$$

$3(42-30)+2(-3\lambda-15)+1(2\lambda+14)=0$

$20-4\lambda=0$

$\lambda=5$

17. $\Delta=0$

$$\begin{vmatrix} 1 & -c & -b \\ -c & 1 & -a \\ -b & -a & 1 \end{vmatrix} = 0$$

$1(1-a^2)+c(-c-ab)-b(ac+b)=0$

$1-a^2-c^2-abc-abc-b^2=0$

$1-a^2-b^2-c^2-2abc=0$

$a^2+b^2+c^2+2abc=1$

18. $A=\left[a_{ij}\right]_{mxn}$

The matrix of rank

$r=\min(m,n)$

19. Non – zero solution

$\Delta=0$

$$\begin{vmatrix} 1 & 2a & a \\ 1 & 3b & b \\ 1 & 4c & c \end{vmatrix} = 0$$

$\therefore a, b, c$ are in HP

20. $\Delta = \begin{vmatrix} 1 & -1 & 1 \\ 1 & 2 & -1 \\ 2 & 1 & 3 \end{vmatrix}$

$= 6(6+1)+1(3+2)+1(1-4)$

$= 7+5-3$

$= 9$

$\Delta \neq 0$

No of nontrivial solution is zero

MATHS- B

21. $x = a\cos^2\theta$

$\frac{dx}{d\theta} = -3a\cos^2\theta\sin\theta$

$y = a\sin^3\theta$

$\frac{dy}{d\theta} = 3a\sin^2\theta\cos^2\theta$

$\frac{dy}{dx} = \frac{\frac{dy}{d\theta}}{\frac{dx}{d\theta}} = \frac{3a\sin^2\theta\cos\theta}{-3a\cos^2\theta\sin\theta} = -\tan\theta$

Now $\sqrt{1+(-\tan\theta)^2} = \sqrt{1+\tan^2\theta} = \sqrt{\sec^2\theta} = \sec\theta$

22. $h(x) = f(g(x))$

$h(x) = f(\sin^{-1}x)$

$h(x) = e^{\sin^{-1}x}$

$h^1(x) = \frac{e^{\sin^{-1}x}}{\sqrt{1-x^2}}$

Now $\frac{h^1(x)}{h(x)} = \frac{\frac{e^{\sin^{-1}x}}{\sqrt{1-x^2}}}{e^{\sin^{-1}x}} = \frac{1}{\sqrt{1-x^2}}$

23. $y = \frac{1}{2}\log\left[1+2\tan^2 x+2\tan x\sec x\right]$

$y = \frac{1}{2}\log\left[\tan^2 x+\sec^2 x+2\tan^2 x+2\tan x\sec x\right]$

$y = \log(\sec x+\tan x)$

$\frac{dy}{dx} = secx$

24. $\dfrac{d}{dx}\left(\tan^{-1}\left(\dfrac{a\cos x\left(\dfrac{\sin x}{\cos x}+\dfrac{b}{a}\right)}{a\cos x\left(1-\dfrac{b\sin x}{a\cos x}\right)}\right)\right)$

$\dfrac{d}{dx}\left(\tan^{-1}\left(\dfrac{\dfrac{b}{a}+\tan x}{1-\dfrac{b}{a}\tan x}\right)\right)$

$\dfrac{d}{dx}\left(\tan^{-1}\left(\dfrac{b}{a}\right)+\tan^{-1}\left(\tan x\right)\right)$

$\dfrac{d}{dx}\left(\tan^{-1}\left(\dfrac{b}{a}\right)+x\right)\Rightarrow 0+1=1$

25. $e^{y}+xy=e$

Differentiate two times

26. Verification

$\underset{x\to 0}{Lt}\dfrac{\tan x}{x}=1$

Continuous

27. $y=xe^{-x}$

$\dfrac{dy}{dx}=-xe^{-x}+e^{-x}$

Again diff w.r.t x

$\dfrac{d^2y}{dx^2}=+xe^{-x}-e^{-x}-e^{-x}$

$y_2+2y_1+y=\left(xe^{-x}-2e^{-x}\right)+2\left(-xe^{-x}+e^{-x}\right)+xe^{-x}=0$

28. $f\left(x\right)=\dfrac{1+\tan x}{1-\tan x}$

$f\left(x\right)=\tan\left(\dfrac{\pi}{4}+x\right)$

$f^{1}\left(x\right)=\sec^{2}\left(\dfrac{\pi}{4}+x\right)$

29. $\left(fog\right)\left(x\right)=x$

$f\left(g\left(x\right)\right)=x$

$f^{1}\left(g\left(x\right)\right)g^{1}\left(x\right)=1$

$g^{1}\left(x\right)=\dfrac{1}{f^{1}\left(g\left(x\right)\right)}=\dfrac{1}{\dfrac{1}{1+\left\{g\left(x\right)\right\}^{5}}}=1+\left\{g\left(x\right)\right\}^{5}$

30. $y=a\cos\left(\log x\right)+b\sin\left(\log x\right)$

$y_1=-a\sin\left(\log x\right)+b\cos\left(\log x\right)\left(\dfrac{1}{x}\right)$

$xy_1=-a\sin\left(\log x\right)+b\cos\left(\log x\right)$

Again diff w.r.t x

$$xy_2 + y_1 = -a\cos(\log x)\left(\frac{1}{x}\right) - b\sin(\log x)\left(\frac{1}{x}\right)$$

$$x^2y_2 + xy_1 = -\left[a\cos(\log x) + b\sin(\log x)\right]$$

$$x^2y_2 + xy_1 = -y$$

31. $\dfrac{d^2x}{dy^2} = \dfrac{d}{dy}\left(\dfrac{dx}{dy}\right) = \dfrac{d}{dx}\left(\dfrac{dx}{dy}\right)\left(\dfrac{dx}{dy}\right)$

$$\frac{d}{dx} = \left(\frac{1}{\frac{dy}{dx}}\right)\left(\frac{dx}{dy}\right)$$

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

$$= \frac{-1}{\left(\frac{dy}{dx}\right)^3}\frac{d^2y}{dx^2} = \frac{-d^2y}{dx^2}\left(\frac{dy}{dx}\right)^{-3}$$

32. $f(x) = 10\cos x + (13 + 2x)\sin x$

$$f(x) = 10\cos x + 13\sin x + 2x\sin x$$

$$f^1(x) = 10\sin x + 13\cos x + 2x\cos x + 2\sin x$$

$$f^{11}(x) = -10\cos x - 13\sin x - 2x\sin x + 2\cos x + 2\cos x$$

$$f^{11}(x) = -10\cos x - 13\sin x - 2x\sin x + 4\cos x$$

$$f^{11}(x) + f(x) = 4\cos x$$

33. $f(x) = \log_{10}^{x}\ ; g(x) = x^2$

$$f^1(x) = \frac{1}{x\log 10}\ ; g^1(x) = 2x$$

$f(x)$ w.r.t $g(x)$

i.e $\dfrac{f^1(x)}{g^1(x)} = \dfrac{\frac{1}{x\log 10}}{2x} = \dfrac{1}{2x^2\log 10}$

34. $\dfrac{d}{dx}\tan^{-1}(\sec x + \tan x)$

$$\frac{d}{dx}\tan^{-1}\left[\frac{1+\sin x}{\cos x}\right]$$

$$\frac{d}{dx}\tan^{-1}\left[\frac{\left(\cos\frac{x}{2} + \sin\frac{x}{2}\right)^2}{\left(\cos\frac{x}{2} + \sin\frac{x}{2}\right)\left(\cos\frac{x}{2} - \sin\frac{x}{2}\right)}\right]$$

$$\frac{d}{dx}\tan^{-1}\left[\tan\left(\frac{\pi}{4} + \frac{x}{2}\right)\right]$$

$$\frac{d}{dx}\left(\frac{\pi}{4} + \frac{x}{2}\right) = 0 + \frac{1}{2} = \frac{1}{2}$$

35. $y = x + \tan x$

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

$\frac{d^2y}{dx^2} = 0 + 2\sec^2 x \tan x$

$\frac{d^2y}{dx^2} = \frac{2}{\cos^2 x}\tan x$

$\cos^2 x \frac{d^2y}{dx^2} = 2(y - x)$

$\cos^2 x \frac{d^2y}{dx^2} + 2x = 2y$

36. $y = \tan^{-1}\left(\frac{\log e + \log x^2}{\log e + \log x^2}\right) + \tan^{-1}\left(\frac{3 + 2\log x}{1 - (3)(2\log x)}\right)$

$y = \tan^{-1}\left(\frac{1 - 2\log x}{1 + 2\log x}\right) + \tan^{-1}\left(\frac{3 + 2\log x}{1 - (3)(2\log x)}\right)$

$y = \tan^{-1}(1) - \tan^{-1}(2\log x) + \tan^{-1}(3) + \tan^{-1}(2\log x)$

$y = \tan^{-1}(1) + \tan^{-1}(3)$

$\frac{dy}{dx} = 0$

37. $x = a(\cos t + t\sin t)$ $\qquad$ $y = a(\sin t - t\cos t)$

$\frac{dx}{dt} = a(-\sin t + t\cos t + \sin t)$ $\qquad$ $\frac{dy}{dt} = a(\cos t + t\sin t - \cos t)$

$= at\cos t$ $\qquad$ $\frac{dy}{dt} = at\sin t$

$\sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} = \sqrt{a^2t^2\cos^2 t + a^2t^2\sin^2 t} = at$

38. If 'f' is an even function and $f^1(x)$ exists then $f^1(0) =$

$f(-x) = f(x)$

$-f^1(-x) = f^1(x)$ put $x = 0$

$f^1(0) = 0$

39. $\frac{d}{dx}\log\left(\tan\left(\tan^{-1}(\sinh x)\right)\right)$

$\frac{d}{dx}\log(\sinh x)$

$\frac{1}{\sinh x}\cosh x = \coth x$

40. $\sin y = x\sin(a + y)$

$x = \frac{\sin y}{\sin(a + y)}$

$\frac{dx}{dy} = \frac{\sin(a + y)\cos y - \sin y\cos(a + y)}{\sin^2(a + y)}$

$$\frac{dx}{dy}=\frac{\sin(a+y-y)}{\sin^2(a+y)}=\frac{\sin a}{\sin^2(a+y)}$$

Now $\frac{dy}{dx}=\frac{\sin^2(a+y)}{\sin a}$

PHYSICS

41. Conceptual

42. $\sigma=\frac{\frac{-\Delta}{r}}{\frac{\Delta l}{l}}$

43. $E=\frac{(stress)^2}{24}$

44. $Y=\frac{Fl}{Ae}$

45. $\Delta P=K\frac{\Delta v}{V}$

46. $F=kx\Rightarrow k=\frac{F}{x}$

$$\frac{k_1}{k_2}=\frac{x_2}{x_1}=n:1$$

47. $e\alpha\frac{Fl}{r^2}$

48. $F\alpha l$

$F_1\alpha l_1-l$

$F_2\alpha l_2-l$

$\frac{F_1}{F_2}=\frac{l_1-l}{l_2-l}$

$l=\frac{F_1l_2-F_2l_1}{F_1-F_2}$

49. $\frac{F}{A}=4\alpha\Delta t$

50. $\frac{-\Delta r}{r}=\sigma\frac{\Delta l}{l}$

$\Delta=\pi r^2$

$\Delta A=\pi 2r\Delta r=2\pi r^2.\frac{\Delta r}{r}$

$=2A\left(-\sigma.\frac{\Delta l}{l}\right)$

$=2A-\frac{F}{Ay}=\frac{-2F\sigma}{y}$

$=\frac{-2\times20\times0.32}{1.1\times10^{11}}=1.16\times10^{-6}cm^2$

51. $Y = 3K(1-2\sigma)$

52. $stress = \frac{F}{A}$

53. $strain = \frac{\Delta l}{l}$

54. Both the cases tensions same, so elongation will be same

55. $w = \frac{1}{2} \times stress \times strain \times V$

56. Conceptual

57. $Thrust = V\alpha g$

58. $S_1 = \frac{\alpha solid}{\alpha liquid}$, $S_2 = \frac{\alpha liquid}{\alpha water}$

59. $Mg = V\alpha g$

60. $Vd_b g = \left(1 - \frac{m}{n}\right) Vdwg$

CHEMISTRY

61. In 13 group stability of +3 oxidation state $\downarrow$ down the group while that of +1 oxidation state "$\uparrow$" due to inert pair effect

62. Al and Be show similar properties due to diagonal relationship

63. $2naAlO_2 + CO_2 + 3H_2O \downarrow\uparrow 2Al(OH)_3 + Na_2CO_3$

64.

65. $BI_3 > BBr_3 > BCl_3 > BF_3$

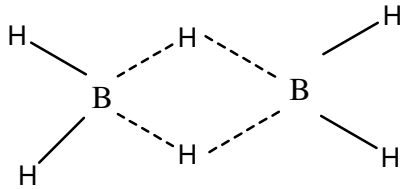
66.

67. $BF_3 + H_2O \rightarrow H^+\left[BF_3OH^-\right]$

68. Boric acid behaves as a Lewis acid, by accepting a pair of $e^{\odot}$ from $OH^{\odot}$ ion of water there by releasing a proton $H_2O + B(OH)_3 \rightarrow \left[B(OH)_4\right]^- + H^{\oplus}$

69. BN is known an as inorganic graphite and has structure similar to graphite

70.



Each bridging bond is formed by two electrons. Hence four $e^{\odot}$ account for bonding in the bridge

71. When diborane is Hydrolysed one can get both orthoboric acid and H_2

$B_2H_6 + 6H_2O \rightarrow 2H_3BO_3 + 6H_2$

72. Compounds that are $e^{\odot}$ deficient act of the given hydrides B_2H_6 satisfies this condition and is therefore a Lewis acid

73. Boric acid $B(OH)_3$ is a weak Lewis acid. It does not donate protons rather accepts $O\overset{\odot}{H}$ ions

$B(OH)_3 + 2H_2O \rightarrow \left[B(OH)_4\right]^- + H_3O^{\oplus}$

74. The solution of borax is alkaline in nature. This is due to its hydrolysis

$Na_2B_4O_7 + 7H_2O \rightarrow 2NaOH + 4H_3BO_3$

75. Microorganisms present in H_1e soil consume Al mospheric Co

76.

77. O_2 gas is not responsible for the rise in term peratire of the earth

78.

79. Highly polluted water has BOD value of more than 17 ppm

80. Excessive concentration of nitrate in drinking water is harmful and can cause melhemo globinemia