

PREBOARD EXAMINATION SET 1

MARKING SCHEME

SUB : MATHEMATICS (041)

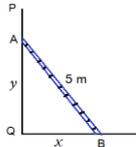
CLASS – XII

MCQ ANSWERS

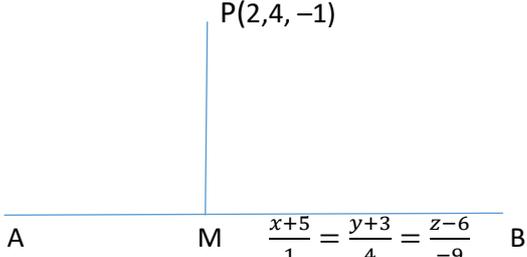
1.(A) 2.(C) 3.(A) 4.(A) 5.(A) 6.(B) 7.(D) 8.(A) 9.(B) 10.(C)

11.(C) 12.(B) 13.(C) 14.(D) 15.(B) 16.(D) 17.(C) 18.(C) 19.(C) 20.(A)

| Q.NO | ANSWER | VALUE POINTS |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 21) | For each value of $\tan^{-1}(-1)$, $\sin^{-1}\left(-\frac{1}{2}\right)$ and $\cos^{-1}\left(\frac{-1}{\sqrt{2}}\right)$ For final correct answer | $3 \times \frac{1}{2}$ $\frac{1}{2}$ |
| 22) | (a) LHL = 0, RHL = 1 = f(0) Equating and finding the value of μ as no such value of μ exists OR(b) Finding the values of $\frac{dy}{d\theta}$ and $\frac{dx}{d\theta}$ Finding $\frac{dy}{dx}$ | 1 1 1.5 0.5 |
| 23) | (a) Putting $\cos x = t$ so that $-\sin x dx = dt$ and limits of t will be 1 to 0 $\therefore I = \int_1^0 \frac{-dt}{1+t^2} = \frac{\pi}{4}$ after simplification OR Writing $I = \int_0^4 x-1 dx = \int_0^1 x-1 dx + \int_1^4 x-1 dx$ $= \int_0^1 -(x-1) dx + \int_1^4 (x-1) dx$ For correct answer | 1 1 1 1 |
| 24) | Finding adjacent sides of the parallelogram as vectors \vec{a} and \vec{b} Finding area of the parallelogram using $ \vec{a} \times \vec{b} $ | 1 1 |
| 25) | $ \vec{a} + \vec{b} + \vec{c} ^2 = (\vec{a} + \vec{b} + \vec{c}) \cdot (\vec{a} + \vec{b} + \vec{c})$ and using $\vec{a}, \vec{b},$ and \vec{c} as a unit vector For correct answer $-3/2$ | 1 1 |
| 26) | LHL = $3a + b$, RHL = $5a - 2b$ and $f(1) = 11$ Equating all and getting the values of a and b as 3 and 2 respectively | 1.5 1.5 |
| 27) | (a) Finding $f'(x)$ and equating $f'(a)$ to 0 to find the value of $a = 120$ Then $f(x) = x^4 - 62x^2 + 120x + 9$ and finding other points where the given function $f(x)$ attains local maximum values. | 1.5 1.5 |

| | | |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| | <p>OR</p> <p>(b) Let PQ be the wall. At certain time t, let AB be the position of the ladder such that $QB = x$ and $AQ = y$ Then $x^2 + y^2 = 5^2 \dots\dots\dots (1)$ Diff. both sides with respect to t, we get $\Rightarrow 2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 0$ $\Rightarrow \frac{dy}{dt} = -\frac{2x}{2y} \times \frac{dx}{dt} \Rightarrow \frac{dy}{dt} = -\frac{x}{y} \times 2 \text{ cm/s} \Rightarrow \frac{dy}{dt} = -\frac{2x}{y} \text{ cm/s} \dots\dots\dots (2)$</p> <p>When $x = 4 \text{ m}$, then from (1), $y = \sqrt{5^2 - 4^2} = 3 \text{ m}$ Putting these values of x and y in equation (2), we find $\frac{dy}{dt} = -\frac{2 \times 4 \text{ m}}{3 \text{ m}} \text{ cm/s} = -\frac{8}{3} \text{ cm/s}$</p> <p>Thus, the rate of decrease of height on the wall is $\frac{8}{3} \text{ cm/s}$</p> |  1.5 1.5 |
| 28) | <p>Let $I = \int \frac{x^3}{x^4 + 3x^2 + 2} dx$ Putting $x^2 = t$ so that $2x dx = dt$ and $\therefore I = \int \frac{t \cdot dt/2}{t^2 + 3t + 2}$ Finding correct integral by partial fraction or any other method</p> | 1.5 1.5 |
| 29) | <p>(a) let $I = \int e^{\tan^{-1}x} \left(\frac{1+x+x^2}{1+x^2} \right) dx$ Putting $x = \tan t$ so that $dx = \sec^2 t dt$ and $\therefore I = \int e^t \left(\frac{1+\tan t + \tan^2 t}{1+\tan^2 t} \right) \sec^2 t dt$ $= \int e^t (\tan t + \sec^2 t) dt = e^t (\tan t) + C$</p> <p>OR (b) taking $\int_0^{\pi/4} \log(1 + \tan x) dx$ as Integral I and applying the property $\int_0^a f(x) dx = \int_0^a f(a-x) dx$</p> <p>Adding both integral and finding the value of I as $\frac{\pi}{8} \log 2$</p> | 1.5 1.5 1.5 1.5 |
| 30) | <p>For correct feasible region For corner point, corresponding value of Z and finding solution</p> | 1.5 1.5 |
| 31) | <p>Let $E_1 =$ Event that the person has a disease. $E_2 =$ Event that the person is healthy. $\therefore P(E_1) = 0.1\% = \frac{0.1}{100} = \frac{1}{1000}$ and $P(E_2) = 1 - \frac{1}{1000} = \frac{999}{1000}$ $A =$ Event that the test result is positive. $\therefore P(A E_1) = 99\% = \frac{99}{100}$ $P(A E_2) = 0.5\% = \frac{0.5}{100} = \frac{5}{1000}$ \therefore By Bayes' Theorem, $P(E_1 A) = \frac{P(E_1) \cdot P(A E_1)}{P(E_1) \cdot P(A E_1) + P(E_2) \cdot P(A E_2)} = \frac{\frac{1}{1000} \times \frac{99}{100}}{\frac{1}{1000} \times \frac{99}{100} + \frac{999}{1000} \times \frac{5}{1000}} = \frac{22}{133}$</p> | 1 2 |

| | | |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| 32) | <p>For showing relation reflexive</p> <p>For showing relation symmetric</p> <p>For showing relation transitive</p> <p>Finding the set of all elements related to 1 and [3]</p> | <p>1</p> <p>1</p> <p>1.5</p> <p>1.5</p> |
| 33) | <p>(a) Critical points are the points where $f'(x) = 0$ or $f'(x)$ does not exist.</p> <p>after solving critical points are $x = 0$ and $x = \frac{1}{8}$</p> <p>finding the value of $f(x)$ at critical and boundary points and deciding absolute maximum is 18 which occurs at $x = -1$ and absolute minimum is $-9/4$ which occurs at $x = 1/8$</p> <p>OR (b) Let $x =$ side of the square to be cut-off</p> <p>So that Volume of the box , $V= (45-2x)(24-2x)x$</p> <p>Taking first derivative of Volume to zero and finding the value of critical point $x = 5\text{cm}, 18\text{cm}$ and rejecting 18 cm ,</p> <p>2^{nd} derivative of $V = (-)\text{ve}$ so Volume is maximum at $x = 5\text{ cm}$</p> <p>Thus Side of the square to be cut-off and Maximum volume = 2450 cm^3.</p> | <p>1</p> <p>1</p> <p>3</p> <p>1.5</p> <p>2</p> <p>1.5</p> |
| 34) | <p>For the points of intersection, we solve equations of given circles</p> <p>The point of intersection are $(\sqrt{3}, 1)$ and $(-\sqrt{3}, -1)$</p> <p>The rough sketch of the given curve is as follows:</p> <div data-bbox="539 1294 975 1630" data-label="Figure"> </div> <p>The required area</p> <p>= Area of the shaded region OBALO</p> <p>= Area of OBLO + Area of BLAB</p> $= \int_0^{\sqrt{3}} (\text{y of line}) dx + \int_{\sqrt{3}}^2 (\text{y of circle}) dx$ $= \int_0^{\sqrt{3}} \frac{x}{\sqrt{3}} dx + \int_{\sqrt{3}}^2 \sqrt{4-x^2} dx$ | <p>1</p> <p>1.5</p> <p>1.5</p> |

| | | | | | | | | | | | | | | | | |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|----|----|-----|-----|---|---|------|---|----|----|----|-----|-----|-------------------------------------|
| | For integrating and finding the area $\frac{\pi}{3}$ sq. units | 1 | | | | | | | | | | | | | | |
| 35) | <p>(a)</p>  <p>Let M be the foot of the perpendicular from given point to given line Taking the general point $(\mu - 5, 4\mu - 3, -9\mu + 6)$ on the line AB and taking this is the coordinate of M. The d. r. of PM = $\mu - 7, 4\mu - 7, -9\mu + 7$ d.r. of AB = $1, 4, -9$ since $AB \perp PM$ $\therefore 1(\mu - 7) + 4(4\mu - 7) - 9(-9\mu + 7) = 0$ $\mu = 1$ \therefore Coordinate of M = $(-4, 1, -2)$ and so $PM = \sqrt{46}$ units</p> <p>OR</p> <p>(b) Let the d.r. of the required line is a, b, c Since required line is perpendicular to given two line so $3a - 16b + 7c = 0$ and $3a + 8b - 5c = 0$ Solving and getting the direction ratio Getting the equation of the required line</p> | <p>1.5</p> <p>1.5</p> <p>1</p> <p>1</p> <p>2</p> <p>1.5</p> <p>1.5</p> | | | | | | | | | | | | | | |
| 36) | <p>(i)</p> <table border="1" data-bbox="220 1435 1353 1559"> <tr> <td>X</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>P(X)</td> <td>k</td> <td>4k</td> <td>9k</td> <td>8k</td> <td>10k</td> <td>12k</td> </tr> </table> <p>(ii) $\sum P(X) = 1$ $\Rightarrow k = \frac{1}{44}$</p> <p>(iii) (a) Mean = $\sum XP(X) = \frac{190}{44}$ OR (b) $P(1 < X < 6) = P(2) + P(3) + P(4) + P(5) = 31/144$</p> | X | 1 | 2 | 3 | 4 | 5 | 6 | P(X) | k | 4k | 9k | 8k | 10k | 12k | <p>1</p> <p>1</p> <p>2</p> <p>2</p> |
| X | 1 | 2 | 3 | 4 | 5 | 6 | | | | | | | | | | |
| P(X) | k | 4k | 9k | 8k | 10k | 12k | | | | | | | | | | |
| 37) | <p>Now, as per question</p> $\frac{dP}{dt} = r \% \text{ of } P \text{ OR } \int \frac{1}{P} dP = \frac{r}{100} \int dt \Rightarrow \log P = \frac{r}{100} t + C \dots \dots \dots (1)$ <p>Given that when $t = 0$ then $\log P_0 = C$ After solving $\log \frac{P}{P_0} = \frac{r}{100} t$</p> | 1 | | | | | | | | | | | | | | |

| | | |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| | <p>(i) when $t = 10$ then $P = 2P_0$ so $\log \frac{2P_0}{P_0} = \frac{r}{100} \times 10 \therefore r = 6.931$</p> <p>(ii) (a) $\log \frac{P}{P_0} = \frac{r}{100} t \Rightarrow \log \frac{P}{1000} = \frac{5}{100} \times 10 \Rightarrow \frac{P}{1000} = e^{1/2} \Rightarrow P = \text{Rs. } 1648$</p> <p>(b) $\log \frac{P}{P_0} = \frac{r}{100} t \Rightarrow \log \frac{200}{100} = \frac{5}{100} t \Rightarrow \log 2 = \frac{t}{20} \Rightarrow t = 20 \log 2 = 13.86 \text{ years}$</p> | <p>1</p> <p>2</p> <p>2</p> |
| 38) | <p>(i) Let the monthly income of Ojaswini and Tejaswini are $3x$ and $4x$ and their expenditures are $5y$ and $7y$.</p> <p>So the equations are $3x - 5y = 15000$ and $4x - 7y = 15000$</p> <p>In matrix form $\begin{bmatrix} 3 & -5 \\ 4 & -7 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 15000 \\ 15000 \end{bmatrix}$ or $AX = B$</p> <p>(ii) $A = -1 \neq 0$ so the system is consistent</p> <p>(iii) Solving by matrix method and getting $x = 30000$ and $y = 15000$</p> <p>(a) \therefore Monthly income of Ojaswini and Tejaswini are ₹90,000 and ₹ 1,20,000</p> <p>OR (b) Monthly expenditure of Ojaswini and Tejaswini are ₹75,000 and ₹ 1,05,000</p> | <p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>2</p> |