VCD: 011222-FYDS-SEM-I PRECALCULUS-$2\frac{1}{2}$hrs-MARKS-75

(90)

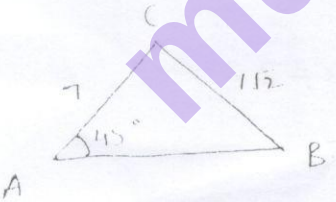
Note: (i) All questions are compulsory.
(ii) Figures to the right indicate marks.
(iii) Illustrations, in-depth answers and diagrams will be appreciated.
(iv) Mixing of sub-questions is not allowed.

Q1. Attempt any three of the following: **(15 marks)**

a. Check whether the function $f: R \to R$ defined as $f(x) = 3x - 2$ is bijective or not. If yes, find the inverse of f
b. Divide polynomial $P(x) = 3x^3 + 9x^2 - 5x - 1$ by $D(x) = x + 4$ and write the quotient and remainder. Also, use the remainder theorem to find $P(-4)$.
c. Find the equation of the line that passes through $(1, -6)$ and is parallel to the line $x + 2y = 6$.
d. Find the equation of the circle that has the points $P(1,8)$ and $Q(5, -6)$ as the endpoints of diameter.
e. Let $f(x) = 2x^2 - 12x + 13$. Express f in standard form and find the vertex. Sketch the graph and find minimum value of f.
f. Solve the equation $2x + \sqrt{x+1} = 8$

Q2. Attempt any three of the following: **(15 marks)**

a. Evaluate
(i) $\log_4 16^{100}$
(ii) $\log_4 2 + \log_4 32$
b. Solve $\log(x^2 + 1) = \log(x - 2) + \log(x + 3)$
c. Solve $e^{2x} - e^x - 6 = 0$
d. Draw the graph of $\sin x, \cos x, \tan x$
e. (I) State law of sines and law of cosines.
(II) Use law of sines to find the angle B



f. If $\cot\theta = 3/4$ and θ is in the third quadrant. Find the value of 5 other trigonometric functions of θ.

Q3. Attempt any three of the following: **(15 marks)**

a. Prove: $2\tan x \sec x = \frac{1}{1-\sin x} - \frac{1}{1+\sin x}$
b. If $\cos x = \frac{-2}{3}$ and x is in the second quadrant, find $\cos 2x$ *and* $\sin 2x$.
c. Find the exact value of the $\sin 22.5^o$.
d. Verify the identity: $\frac{\sin 3x - \sin x}{\cos 3x + \cos x} = \tan x$
e. Solve the equation $1 + \sin\theta = 2\cos^2\theta$
f. Write $\sin(2\cos^{-1} x)$ as an algebraic expression in x only, where $-1 \le x \le 1$.

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Q4. Attempt any three of the following: **(15 marks)**

a. Use Cramer's rule to solve the system of equations:

$$6x + y - 3z = 5$$
$$x + 3y - 2z = 5$$
$$2x + y + 4z = 8$$

b. Solve the following system of equations using Gaussian Elimination method:

$$2x - y + 3z = 9$$
$$x + y + z = 6$$
$$x - y + z = 2$$

c. Express the complex no. $-\sqrt{3} - i$ in the polar form.

d. Find the three cube roots of $z = 1 + i$.

e. Let $u = 2i + 2j - k, v = 5i - 4j + 2k$ be two vectors. Find a unit vector which is perpendicular to both u and v.

f. Let $u = < 2, -2, -1 >, v = < 1,2,2 >$ be two vectors. Find the angle between u and v.

Q5. Attempt any three of the following: **(15 marks)**

a. Find the vertices, foci, length of transverse axis and asymptotes of the hyperbola and sketch its graph $x^2 - 9y^2 + 9 = 0$

b. Find the equation of the ellipse whose foci are $(\pm 4,0)$, vertices are $(\pm 5,0)$. Also, sketch it's graph.

c. Using principal of mathematical induction, prove that

$$2 + 4 + 6 + \cdots + 2n = n(n + 1)$$

d. The third term of the geometric sequence is $-\frac{1}{3}$ and the sixth term is 9. Find the first and second term.

e. Evaluate the limit if it exists :

(i) $\lim_{x \to -3} \frac{x^2 - 9}{2x^2 + 7x + 3}$

(ii) $\lim_{x \to 0} \frac{|x|}{x}$

f. Find the derivative of the function $f(x) = 1 - 3x^2$ at $x = 2$.