

S. B. Roll. No.....

APPLIED MATHEMATICS-I
1st Exam/Common/2952/Nov'24
(For 2018 Batch Onwards)

Duration: 3Hrs.

M.Marks:75

SECTION-A

Q1. a) Choose the correct answer.

15x1=15

- i. If ${}^{n+1}C_5 = {}^{n+1}C_4$ then n is equal to a) 10 b) 9 c) 8 d) 5
- ii. The polar co-ordinates of (-1, -1) are
a) $(\sqrt{2}, \pi/4)$ b) $(\sqrt{2}, 3\pi/4)$ c) $(\sqrt{2}, 5\pi/4)$ d) $(\sqrt{2}, -\pi/4)$
- iii. The expansion $(2+5x)^{-10}$ is valid only if
a) $|x| < \frac{2}{5}$ b) $|x| \leq \frac{5}{2}$ c) $|x| \leq 1$ d) none of these
- iv. If $A = \begin{bmatrix} 1 & -1 \\ -1 & -1 \end{bmatrix}$, then $|A| =$ a) -2 b) 2 c) 1 d) 0
- v. The characteristic of $\log(0.00175)$ is a) 0 b) $\bar{3}$ c) $\bar{2}$ d) 2

b) State True or False.

- vi. A square matrix is singular matrix if $|A| = 0$
- vii. Slope of the straight line $x - 3y + 2 = 0$ is $\frac{-1}{3}$.
- viii. $\cos(A - B) = \cos A \cos B + \sin A \sin B$
- ix. If $\sin \theta = \frac{1}{4}$ and $\cos \theta = -1$, then θ lies in 3rd quadrant.
- x. The quotient of fraction $\frac{2x^2 + 5}{2x^2 + 3x + 2}$ is 1.

c) Fill in the blanks.

- xi. Homogeneous system as _____ solution if $D = D_1 = D_2 = D_3 = 0$.
- xii. Two lines are _____ if their slopes are equal.
- xiii. Modules of $1 + i\sqrt{3}$ is _____
- xiv. $\sin 5x - \sin x =$ _____
- xv. $\sin(420^\circ) =$ _____

SECTION-B

Q2. Attempt any six questions.

6x5=30

- $\frac{\log x}{z-x} = \frac{\log y}{x-y} = \frac{\log z}{y-z}$
- a. If $\frac{\log x}{z-x} = \frac{\log y}{x-y} = \frac{\log z}{y-z}$ then show that $x^x y^y z^z = 1$
- b. Find the modulus and amplitude of $2 - i2\sqrt{3}$.
- c. Find the area of the triangle whose vertices are (-2, 4), (2, -6) and (5, 4) using determinants.
- d. Resolve into partial fractions $\frac{x}{(x^3 + 1)}$
- e. Find the constant term in the expansion of $\left(2x^2 - \frac{1}{3x^3}\right)^{10}$

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- f. If $\sin(A+B) = \frac{\sqrt{3}}{2}$ and $\cos(A-B) = \frac{\sqrt{3}}{2}$, then find A and B, where A+B and A-B are positive acute angles.
- g. Prove that $\tan(60^\circ + A) \tan(60^\circ - A) = \frac{2 \cos 2A + 1}{2 \cos 2A - 1}$
- h. Find the equation of a straight line which passes through (2, -3) and whose intercepts on the axes are equal in magnitude but opposite in sign.
- i. Find the acute angle between the $3x-2y+4=0$ and $7x+2y+6=0$.

SECTION-C

Q3. Attempt any three questions.

3x10=30

- i. Find the equation of circle passing through two points (4, 1), (6, 5) and centre lies on the line $4x+y=16$.
- ii. Solve the equations using matrix method
 $3x+4y+7z-14=0$
 $2x-y+3z=4$
 $x+2y-3z=0$
- iii. A tower subtends an angle of 60° at a point on the same level as the foot of the tower and at a second point 10metres above the first the angle of depression of the tower is 30° . Find the height of the tower.

- iv. Prove that $\frac{\sin A - \sin 3A + \sin 5A - \sin 7A}{\cos A - \cos 3A - \cos 5A + \cos 7A} = \cot 2A$
- v. If x is so small that its square and higher powers may be neglected then Show that:

$$\frac{\sqrt{1-2x} + (1+3x)^{4/3}}{3+x+\sqrt{4-x}} = \frac{2}{5} + \frac{27x}{50}$$

P.S.B.T.E. & I.T.

