

MATH-113 APPLIED MATHEMATICS – I

COMMON WITH AUTO-MOBILE & DIESEL, AUTO & FARM MACHINERY, AUTOMATION, ARCHITECTURE, CAST METAL & FOUNDRY, CHEMICAL, CIVIL, CMT, DIE & MOULD, FOUNDRY & PATTERN MAKING, FOOTWEAR, GLASS & CERAMICS, HEAT VENTILATION, AIR CONDITIONING & REFRIGERATION, LEATHER, LAND & MINE SURVEYING, MINING, MECHANICAL, METALLURGY & WELDING, MECHATRONICS, PRECISION MECHANICAL & INSTRUMENT, PGA, PETROLEUM, PETROCHEMICAL, QUANTITY SURVEY, RAC, SUGAR, TEXTILE SPINNING, TEXTILE DYEING & PRINTING & TEXTILE WEAVING TECHNOLOGIES.

PAPER 'A' (Subjective)

Time: 2:30 Hours

SECTION – I

Marks: 60

Q.1: Write short answer to any Eighteen (18) questions: -

18 × 2 = 36

1. Solve the quadratic equation $x(x+7) = (2x-1)(x+4)$ by factorization.
2. Discuss the nature of roots of equation $x^2 + x + 1 = 0$.
3. Find the value of 'k', if the sum of roots of equation $(2k-1)x^2 + (4k-1)x + k + 3 = 0$ is $\frac{5}{2}$.
4. Define a sequence.
5. Find the 7th term of an A.P. 1, 4, 7, ...
6. Find the sum of the series $3 + 11 + 19 + \dots$ to 16 terms.
7. Find the A.M between $\sqrt{5} - 4$ and $\sqrt{5} + 4$.
8. Sum to 5 term the series $1 + 3 + 9 + \dots$
9. Find the sum of infinite geometric series in which $a = 128$ and $r = -\frac{1}{2}$.
10. Expand the expression $\left(\frac{x}{y} + \frac{y}{x}\right)^4$
11. Calculate $(1.04)^5$ by binomial theorem up to two decimal places.
12. Find the 5th term in the expansion of $\left(\frac{x}{y} - \frac{y}{x}\right)^4$
13. Define proper fraction and give example.
14. Resolve $\frac{1}{x^2 - x}$ into partial fractions.
15. Write in the form of partial fractions $\frac{x^5}{x^4 - 1}$.
16. Convert $12^\circ 40'$ into radian measure.
17. What is the length of an arc of a circle of radius 5 cm whose central angle is 140° .
18. If $\sin \theta = \frac{5}{6}$ and θ is an obtuse angle, find $\cos \theta$.
19. Prove that: $2\sin 45^\circ + \frac{1}{2}\operatorname{cosec} 45^\circ = \frac{3}{\sqrt{2}}$
20. Prove that: $1 - 2\sin^2 \theta = 2\cos^2 \theta - 1$
21. Prove that: $\cos\left(\frac{\pi}{2} - \theta\right) = \sin \theta$
22. Show that: $\cos(\alpha + \beta) - \cos(\alpha - \beta) = -2\sin \alpha \sin \beta$
23. Prove that: $\tan(45^\circ + \theta)\tan(45^\circ - \theta) = 1$
24. Express the sum $\cos 12\theta - \cos 4\theta$ as product.
25. In right triangle ABC, $b = 6$, $\alpha = 35^\circ$, $\gamma = 90^\circ$, Find side 'a'.
26. The sides of a triangle are 16, 20 and 33 meters respectively. Find its greatest angle.
27. In any triangle ABC in which $a = 5$, $c = 6$, $\alpha = 45^\circ$, find γ .

SECTION - II

Note: Attempt any three (03) questions.

3 × 8 = 24

Q.2. (a) Solve the given equation by factorization $\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$

(b) The roots of the equation $px^2 + qx + q = 0$ are α, β prove that: $\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} + \sqrt{\frac{q}{p}} = 0$

Q.3. (a) What term in the arithmetic progression 4, 1, -2, ... is -77.

(b) A rubber ball is dropped from a height of 4.8cm. It continuously rebounds, each time rebounding $\frac{3}{4}$ of the distance of the proceeding fall. How much distance has it traveled when it strikes the ground for the sixth time?

Q.4. (a) Find the term independent of x in the expansion of $\left(2x^2 + \frac{1}{x}\right)^9$.

(b) Resolve into partial fractions $\frac{3x+7}{(x^2+x+1)(x^2-4)}$

Q.5. (a) Prove that: $\frac{\tan \theta}{1-\cot \theta} + \frac{\cot \theta}{1-\tan \theta} = \sec \theta \operatorname{cosec} \theta + 1$

(b) If $\sin \alpha = \frac{4}{5}$ and $\sin \beta = \frac{12}{13}$, both α & β are in 1st quadrant, find $\sin(\alpha - \beta)$.

Q.6. (a) Express the sum $\sin 3\theta + \sin 5\theta + \sin 7\theta + \sin 9\theta$ as a product.

(b) From a light-house, angles of depression of two ships on opposite of the light-house are observed to be 30° and 45° . If the height of the light-house be 300m, find the distance between the ships if the line joining them passing through foot of light house.
