

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 $6x^2 - 5x = 4$ by factorization.
2. Find the sum and product of the roots of the equation $9x^2 + 6x + 1 = 0$
3. Form the quadratic equation whose roots are $-2 + \sqrt{3}$, $-2 - \sqrt{3}$.
4. Define a sequence.
5. Find the 7th term of an A.P. 1, 4, 7, ...
6. Find the A.M between $\sqrt{5} - 4$ and $\sqrt{5} + 4$.
7. Write the formula of sum of the first 'n' terms of a G.P. for $|r| < 1$ and for $|r| > 1$.
8. Find the geometric mean between 8 and 72.
9. Find the sum of infinite geometric series in which $a = 128$ and $r = -\frac{1}{2}$.
10. Expand $\left(\frac{x}{2} - \frac{2}{y}\right)^4$ by using binomial theorem.
11. Calculate $(1.02)^{10}$ by binomial theorem up to two decimal places.
12. Expand $\frac{1}{\sqrt{1+x}}$ to three terms.
13. Resolve $\frac{1}{x^2 - x}$ into partial fractions.
14. Write identity equation of $\frac{x-5}{(x+1)(x^2+3)}$
15. Form of partial fractions of $\frac{1}{(x+1)^2(x-2)}$ is _____.
16. What is the length of an arc of a circle of radius 5 cm whose central angle is 140° .
17. Find the radius of the circle, when $\ell = 8.4\text{m}$, $\theta = 2.8$ rad.
18. Prove that: $(1 + \sin \theta)(1 - \sin \theta) = \frac{1}{\sec^2 \theta}$
19. Prove that: $\cos^4 \theta - \sin^4 \theta = 1 - 2\sin^2 \theta$
20. Prove that: $\sin\left(\frac{\pi}{2} - \theta\right) = \cos \theta$
21. Show that: $\sin(\alpha + \beta) + \sin(\alpha - \beta) = 2\sin \alpha \cos \beta$
22. Express $\cos(a + b)\cos(a - b) - \sin(a + b)\sin(a - b)$ as single term.
23. Express the sum $\cos \theta - \cos 4\theta$ as product.
24. Define the law of Sine.
25. In right triangle ABC, $\gamma = 90^\circ$, $a = 5$, $c = 13$ then find value of angle α .
26. The sides of a triangle are 16, 20 and 33 meters respectively. Find its greatest angle.
27. In any triangle ABC in which $a = 16$, $b = 17$, $\gamma = 25^\circ$, find 'c'.

SECTION - II

Note: Attempt any three (03) questions.

3 × 8 = 24

Q.2. (a) Solve the equation $\frac{1}{x+1} + \frac{1}{x+2} + \frac{1}{x+3} = \frac{3}{x}$ by using quadratic formula.

(b) Show that the roots of the equation $(mx + c)^2 = 4ax$ will be equal; is $c = \frac{a}{m}$.

Q.3. (a) The 9th term of an A.P is 30 and the 17th term is 50. Find the first three terms.

(b) Find 'n' so that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may be the A.M's between a and b.

Q.4. (a) Find the 5th term in the expansion of $\left(2x^2 - \frac{3}{x}\right)^{10}$.

(b) Resolve $\frac{3x^2 - 2x - 5}{(x-2)(x+2)(x+3)}$ into partial fractions.

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

(b) Show that: $\sqrt{3} \cos \theta - \sin \theta = 2 \cos(\theta + 30^\circ)$

Q.6. (a) Prove that: $\sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta$

(b) From a point on the ground the measure of angle of elevation of the top of a tower is 30° . On walking 100 meters towards the tower the measure of the angle is found to be 45° . Find the height of the tower.
