

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. Discuss the nature of the roots of the equation $2x^2 - 7x + 3 = 0$
3. If α, β are the roots of equation $x^2 - 4x + 2 = 0$ find the equation whose roots are: $-\alpha, -\beta$.
4. Define finite Sequence.
5. Find the 7th term of A.P., in which the first term is 7 and the common difference is -3.
6. Find the sum of the series $3 + 11 + 19 + \dots$ to 16 terms.
7. Write down the geometric sequence in which the 1st term is 2 and second term is -6 and $n = 5$.
8. Find the G.M. between $\frac{4}{3}$ and 243.
9. Find the sum of infinite geometric series in which $a = 128$ & $r = -\frac{1}{2}$.
10. Expand by Bi-nominal theorem $\left(\frac{x}{2} - \frac{2}{y}\right)^4$
11. Find the 7th term in the expansion of $\left(x - \frac{1}{x}\right)^9$.
12. Expand $\frac{1}{\sqrt{1+x}}$ to three terms.
13. Which will be the middle term/terms in the expansion of $\left(x + \frac{3}{x}\right)^{15}$.
14. Resolve $\frac{1}{x^2 - x}$ into partial fractions.
15. Form of partial fractions of $\frac{1}{(x^3 - 1)(x^2 + 1)}$ is _____.
16. Convert $\frac{2\pi}{3}$ radians into degree measure.
17. Find 'x' if $\tan^2 45^\circ - \cos^2 60^\circ = x \sin 45^\circ \cos 45^\circ \tan 60^\circ$.
18. Prove that: $\cos 30^\circ \cos 60^\circ - \sin 30^\circ \sin 60^\circ = 0$.
19. Prove that: $1 - 2\sin^2 \theta = 2\cos^2 \theta - 1$
20. Prove that: $\cos\left(\frac{\pi}{2} - \theta\right) = \sin \theta$
21. Show that: $\sin\left(\theta + \frac{\pi}{6}\right) + \cos\left(\theta + \frac{\pi}{3}\right) = \cos \theta$
22. Express $\cos(a + b)\cos(a - b) - \sin(a + b)\sin(a - b)$ as single term.
23. Prove that: $\cos \alpha = \cos^2 \frac{\alpha}{2} - \sin^2 \frac{\alpha}{2}$
24. Given that, $\gamma = 90^\circ, \alpha = 35^\circ, a = 5$, find angle β .
25. Define angle of elevation.
26. In any triangle ABC in which $a = 5, c = 6, \alpha = 45^\circ$, find γ .
27. Find the distance of man from the foot of tower 100m high if the angle of elevation of its top as observed by the man is $52^\circ 30'$.

SECTION - II

Note: Attempt any three (03) questions.

3 × 8 = 24

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

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

Q.3. (a) If S_1, S_2, S_3 be sums to $n, 2n, 3n$ terms of an arithmetic progression, Show that $S_3 = 3(S_2 - S_1)$

(b) The A.M of two positive integral numbers exceeds their (positive) G.M by 2 and their sum is 20. Find the numbers.

Q.4. (a) Find the middle term in the expansion of $\left(3x^2 + \frac{1}{2x}\right)^{10}$.

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

Q.5. (a) A railway train is traveling on a curve of half a kilometer radius at the rate of 20 km per hour, Through what angle had it turned in 10 seconds.

(b) If $m = \tan \theta + \sin \theta$ and $n = \tan \theta - \sin \theta$, than prove that: $m^2 - n^2 = 4\sqrt{mn}$

Q.6. (a) Prove that: $\tan 3\theta = \frac{3 \tan \theta - \tan^3 \theta}{1 - 3 \tan^2 \theta}$

(b) On walking 300 meters towards a tower in a horizontal line through its base, the measure of the angle of elevation of this top changes from 30° to 60° . Find the height of the tower.
