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: -** $18 \times 2 = 36$

1. Solve the quadratic equation $x^2 - x = 2$ by factorization.

2. Discuss the Nature of the roots of the equations: $2x^2 - 7x + 3 = 0$.

3. If α, β are the roots of the equation $x^2 - 4x + 2 = 0$, find the equations whose roots are $\dfrac{1}{\alpha}$ and $\dfrac{1}{\beta}$.

4. Find the 7th term of an A.P., $1, 4, 7, \ldots$

5. Find the sum of the series $3 + 11 + 19 + \ldots$ to 16 terms.

6. Find the term indicate in the following G.P. $1, 3^3, 3^6, \ldots, 6^{th}$ term.

7. Sum of 5 terms of the series $1 + 3 + 9 + \ldots$

8. Write the formulas of sum of the first 'n' terms of a geometric sequence for $|r| < 1$ and for $|r| > 1$.

9. Find the sum of infinite geometric series in which $a = 128$ and $r = -\dfrac{1}{2}$.

10. Expand $\left(\dfrac{x}{y} + \dfrac{y}{x} \right)^4$ by Binomial theorem.

11. Find the 5th term in the expansion of $\left(2x - \dfrac{x^2}{4} \right)^7$.

12. Expand $\dfrac{1}{(1+x)^2}$ to three terms.

13. Define proper fraction and give one example.

14. Resolve $\dfrac{1}{x^2 - x}$ into partial fractions.

15. Write an identity equation of $\dfrac{8x^2}{(1-x^2)(1+x^2)^2}$.

16. Convert $42° 36' 12''$ into radian measure.

17. Find 'x' if $\tan^2 45° - \cos^2 60° = x \sin 45° \cos 45° \tan 60°$.

18. Prove that $\cos^4 \theta - \sin^4 \theta = 1 - 2\sin^2 \theta$.

19. What is the length of an arc of a circle of radius 5cm whose central angle is 140º?

20. Show that: $\sin(\alpha + \beta) + \sin(\alpha - \beta) = 2\sin\alpha\cos\beta$.

21. Prove that: $\cos(-\beta) = \cos\beta$.

22. Express $\cos\theta - \cos4\theta$ as product.

23. Find $\cos\theta$ if $\sin\theta = \dfrac{7}{25}$ and angle θ is an acute angle.

24. Write two laws of cosine.

25. In right triangle ABC, $\gamma = 90º$, a = 5, c = 13, then find the value of angle α.

26. In any triangle ABC if a = 5, c = 6, $\alpha = 45º$, find γ.

27. A string of a flying kite is 200m long, and its angle of elevation is 60º. Find the height of the kite above the ground taking the string to be fully stretched.

SECTION – II

Note: Attempt any three (03) questions. $3 \times 8 = 24$

Q.2:   Solve the equation $\dfrac{x}{x+1} + \dfrac{x+1}{x+2} + \dfrac{x+2}{x+3} = 3$ by using quadratic formula.

Q.3:   **(a)**   If 5, 8 are two A.M's between a and b, find a and b.

          (b)   Insert three G.M's between 256 and 1.

Q.4:   **(a)**   Find the middle term/terms of the expansion $\left(3x^2 + \dfrac{1}{2x} \right)^{10}$.

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

Q.5:   **(a)**   Prove that $\dfrac{\cos^3 t - \sin^3 t}{\cos t - \sin t} = 1 + \sin t \cos t$.

          (b)   Show that $\cos(\alpha + \beta)\cos(\alpha - \beta) = \cos^2 \alpha - \sin^2 \beta$.

Q.6:   From a point on the ground the measure of angle of elevation of the top of tower is $30°$. On walking 100 meters towards the tower the measure of the angle is found to be of $45°$. Find the height of the tower.

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