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 equation $x^2 - 2x - 899 = 0$ by completing the square.

2. Discuss the nature of the roots of the equation $9x^2 + 6x + 1 = 0$.

3. For what value of k, the sum of roots of $3x^2 + kx + 5 = 0$ may be equal to the product of roots.

4. Define a sequence.

5. If $\dfrac{1}{a}, \dfrac{1}{b}, \dfrac{1}{c}$ are in A.P, show that $b = \dfrac{2ac}{a+c}$.

6. Write the nth term of a Geometric progression.

7. Define geometric mean.

8. Find the sum of the series $1 + \dfrac{1}{3} + \dfrac{1}{9} + \ldots$ to 6 terms.

9. Is the series $1 + 4 + 16 + 64 + \ldots$ divergent or convergent.

10. Expand $\left(2x - 3y\right)^4$ by Binomial theorem.

11. Calculate $\left(1.04\right)^5$ by binomial theorem up to two decimal places.

12. Using Binomial series calculate $\sqrt[3]{65}$ to the nearest hundredth.

13. Write the first three terms in the expansion of $\left(2 + x\right)^{-3}$.

14. Resolve $\dfrac{2x}{\left(x-2\right)\left(x+5\right)}$ into partial fractions.

15. Form of partial fractions of $\dfrac{1}{\left(x^2+1\right)\left(x-4\right)^2}$ is _____.

16. Define radian measure.

17. Find the length of arc cut off on a circle of radius 3cm by a central angle of 2 radians.

18. Prove that: $\tan^2 30° + \tan^2 45° + \tan^2 60° = \dfrac{13}{3}$

19. Prove that: $\dfrac{1}{1+\sin\theta} + \dfrac{1}{1-\sin\theta} = 2\sec^2\theta$

20. Prove that: $\cos\left(-\beta\right) = \cos\beta$

21. Express $\sin x \cos 2x - \sin 2x \cos x$ as single term.

22. Prove that: $\sin^2\alpha = \dfrac{1-\cos 2\alpha}{2}$

23. Express $\cos\theta - \cos 4\theta$ as product.

24. Define the law of Sine.

25. Given that $\alpha = 30°$, $\gamma = 135°$ and c = 10 find 'a'.

26. In any triangle ABC in which b = 45, c = 34, $\propto = 52°$, find a.

27. Define angle of depression.

SECTION – II

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

Q.2. **(a)**   Solve the equation $\dfrac{1}{a+b+x} = \dfrac{1}{a} + \dfrac{1}{b} + \dfrac{1}{x}$ By factorization.

(b)   If the difference of the roots of $x^2 - 7x + k - 4 = 0$ is 5, find the value of k and the roots.

Q.3. **(a)**   Sum the series .3+ .33+ .333+…. to n terms.

(b)   Insert 6 G.M's between 2 and 256.

Q.4. **(a)**   Find the term involving x^9 in the expansion of $\left(x^3 + \dfrac{1}{x} \right)^7$.

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

Q.5. **(a)**   A space man land on the moon and observes that the Earth's diameter subtends an angle of $1^{o}54'$ at his place of landing. If the Earth's radius is 6400km, find the distance between the Earth and the moon.

(b)   Prove that: $\left(\operatorname{cosec}\theta - \cot\theta \right)^2 = \dfrac{1-\cos\theta}{1+\cos\theta}$

Q.6. **(a)**   Prove that: $\sin 20° \sin 40° \sin 60° \sin 80° = \dfrac{3}{16}$

(b)   A town B is 15km due North of a town A. The road from A to B runs North 27º East to G, then North 34º West to B. Find the distance by road from the town A to B.

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