DAE/IA-2019/06 FIRST YEAR

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 $mx^2 + (1+m)x + 1 = 0$ by factorization.
2. Discuss the nature of the roots of the equation $x^2 - 2\sqrt{2}x + 2 = 0$
3. Form the quadratic equation whose roots are $-2+\sqrt{3}, -2-\sqrt{3}$
4. Define infinite sequence.
5. Write the formula to find the sum of 'n' terms of an arithmetic sequence.
6. Find the A.M between $\sqrt{5}-4$ and $\sqrt{5}+4$
7. If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are G.P, show that the common ratio is $\pm\sqrt{\frac{a}{c}}$
8. Sum to 5 term the series $1+3+5+\ldots$
9. Is the series $6+3+\frac{3}{2}+\frac{3}{4}+\frac{3}{8}+\ldots$ divergent or convergent.
10. Expand the Binomial theorem $\left(\frac{x}{y}+\frac{y}{x}\right)^4$.
11. State Binomial Theorem for positive integer n.
12. Expand $(1+2x)^{-2}$ to three terms.
13. Which term is the middle term or terms in the Binomial expansion of $(a+b)^n$, When 'n' is odd.
14. Define proper fraction and give example.
15. Form of partial fractions of $\frac{1}{(x+1)(x-2)}$ is _____.
16. Convert $42^\circ\ 36'\ 12''$ into radian measure.
17. Find the radius of the circle, when ℓ = 8.4m, θ = 2.8 rad.
18. Prove that: $\frac{2\tan\frac{\pi}{6}}{1-\tan^2\frac{\pi}{6}} = \sqrt{3}$
19. Show that: $\cot^4\theta + \cot^2\theta = \operatorname{cosec}^4\theta - \operatorname{cosec}^2\theta$
20. Prove that: $\sin(-\theta) = -\sin\theta$
21. Show that: $\cos(\alpha+\beta) - \cos(\alpha-\beta) = -2\sin\alpha\sin\beta$
22. If $\sin\theta = \frac{4}{5}$ and the terminal side of θ lies in 1st quadrant, find $\cos\frac{\theta}{2}$.
23. Express $\cos 3\theta\cos\theta$ as sum or difference.
24. Define the laws of cosines.
25. In any triangle ABC, if a = 9, b = 5, γ = 32º find c.
26. In any triangle ABC if a = 3, b = 7, β = 85º find α.
27. The shadow of Qutab-Minar is 81m long when the measure of the angle of elevation of the sun is 41º31'. Find the height of the Qutab-Minar.

SECTION – II

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

Q.2. (a) Solve the equation $x^2 - 3\left(x + \frac{25}{4}\right) = 9x - \frac{25}{2}$ by using quadratic formula.

(b) Show that the roots of the equation $(a + 2b)x^2 + 2(a + b + c)x + (a + 2c) = 0$ are rational.

Q.3. (a) The sum of three numbers in A.P is 24 and their product is 440. Find the numbers.

(b) If the second term of a G.P is 2 and the 11th term is $\frac{1}{256}$, what is the first term and the nth term?

Q.4. (a) If x is nearly equal to unity, prove that $\frac{mx^n - nx^m}{x^n - x^m} = \frac{1}{1-x}$

(b) Resolve $\frac{6x + 27}{4x^3 - 9x}$ into partial fractions.

Q.5. (a) If $\sin\theta = \frac{4}{5}$, and $\frac{\pi}{2} < \theta < \pi$ find trigonometric ratios of θ.

(b) Prove that: $(1 - \tan\theta)^2 + (1 - \cot\theta)^2 = (\sec\theta - \operatorname{cosec}\theta)^2$.

Q.6. (a) Prove that: $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$

(b) Solve the triangle ABC with given data: $c = 4$, $\alpha = 70^\circ$, $\gamma = 42^\circ$.

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