

**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 equation  $x^2 - 3x = 2x - 6$  by quadratic formula.
2. If the sum of the roots of  $4x^2 + kx - 7 = 0$  is 3. Find the value of k.
3. Form the quadratic equation whose roots are  $i\sqrt{3}$ , and  $-i\sqrt{3}$ .
4. Find the sequence whose general term is  $4n + 1$ .
5. Find the sum of the series  $5 + 8 + 11 + 14 + \dots$  to n terms.
6. Define the common difference.
7. Write down the geometric sequence in which first term is 2 and the second term is  $-6$  and  $n = 5$ .
8. Find the sum of the series  $1 + \frac{1}{3} + \frac{1}{9} + \dots$  to 6 terms.
9. Find the sum of the infinite geometric series  $2 + \sqrt{2} + 1 + \dots$ .
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  $\frac{1}{(1+x)^2}$  to three terms.
13. Define improper fraction and give one example.
14. Resolve  $\frac{2x}{(x-2)(x+5)}$  into partial fractions.
15. Write an identity equation of  $\frac{2x+5}{x^2+5x+6}$ .
16. Convert  $\frac{2\pi}{3}$  rad into degree measure.
17. Find the radius of the circle when  $\ell = 8.4\text{cm}$  and  $\theta = 2.8\text{rad}$ .
18. Prove that:  $2 \sin 45^\circ + \frac{1}{2} \operatorname{cosec} 45^\circ = \frac{3}{\sqrt{2}}$ .
19. Prove that  $1 - 2 \sin^2 \theta = 2 \cos^2 \theta - 1$ .
20. Prove that  $\tan(45^\circ + \theta) \tan(45^\circ - \theta) = 1$ .
21. Prove that  $\tan 2\alpha = \frac{2 \tan \alpha}{1 - \tan^2 \alpha}$ .
22. If  $\sin \theta = \frac{4}{5}$  and the terminal side of ' $\theta$ ' lies in 1<sup>st</sup> quadrant, find  $\cos \frac{\theta}{2}$ .
23. Express  $2 \cos 5\theta \sin 3\theta$  as sum or difference.
24. Define the law of Sine.
25. Given that  $\alpha = 30^\circ$ ,  $\gamma = 135^\circ$  and  $c = 10$  find 'a'.
26. In any triangle ABC in which  $a = 16$ ,  $b = 17$ ,  $\gamma = 25^\circ$ , find 'c'.
27. The shadow of Qutab-Minar is 81m long when the measure of the angle of elevation of the sun is  $41^\circ 31'$ . Find the height of the Qutab-Minar.

**SECTION - II**

Note: Attempt any three (03) questions.

3 × 8 = 24

- Q.2:** (a) Solve the equation  $32 - 3x^2 = 10x$  by completing the square.  
 (b) Show that the roots of the equation  $px^2 - (p - q)x - q = 0$  are rational.
- Q.3:** (a) If  $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$  are in A.P. Show that  $b = \frac{2ac}{a + c}$ .  
 (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:** Find the term independent of x in the expansion of  $\left(2x^2 + \frac{1}{x}\right)^9$ .
- Q.5:** (a) If  $m = \tan \theta + \sin \theta$  and  $n = \tan \theta - \sin \theta$  then prove that  $m^2 - n^2 = 4\sqrt{mn}$   
 (b) If  $\sin \alpha = \frac{4}{5}$  and  $\sin \beta = \frac{12}{13}$ , both  $\alpha$  and  $\beta$  are in the 1<sup>st</sup> quadrant, find  $\cos(\alpha + \beta)$
- Q.6:** (a) How far is a man from the foot of tower 150 meters high, if the measure of the angle of elevation of its top as observed by him is  $40^\circ 30'$ .  
 (b) In any  $\Delta ABC$  by using the law of cosines  $a = 7, c = 9, \beta = 112^\circ$ , find b.

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