

# ARUNACHAL PRADESH PUBLIC SERVICE COMMISSION

## MATHEMATICS

TIME – 3 HOURS

FULL MARKS : 100

- Note:** 1. Question No. 1 to 14 carry 4 marks each  
2. Question No. 15 to 30 carry 5 marks each  
3. Calculator is not allowed

### SOLVE ANY TEN (10) QUESTIONS FROM QUESTION NO 1 TO 14

1. Prove that  $5 - \sqrt{3}$  is an irrational number.
2. Show that  $x = 2, y = 1$  and  $x = 4, y = 4$  are solutions of the system of equations  $3x - 2y = 4$  and  $6x - 4y = 8$ .
3. 4 chairs and 3 tables cost Rs. 2100 and 5 chairs and 2 tables cost Rs. 1750. Find the cost of a chair and a table separately.
4. If  $\alpha, \beta$  are the zeros of the polynomial  $f(x) = x^2 + x + 1$ , then find the value of  $\frac{1}{\alpha} + \frac{1}{\beta}$ .
5. Find the largest positive integer that will divide 398, 436 and 542 leaving remainders 7, 11 and 15 respectively.
6. Express each of the following positive integers as the product of its prime factors: 3825 and 5005.
7. The circumference of a circle exceeds the diameter by 16.8 cm. Find the radius of the circle.
8. Show that the points (1, -1), (5, 2) and (9, 5) are collinear.
9. Prove that  $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta \operatorname{cosec}\theta$ .
10. A man goes 10m due east and then 24m due north. Find the distance from the starting point.
11. The diagonal BD of a parallelogram ABCD intersects the segment AE at the point F, where E is any point on the side BC. Prove that  $DF \times EF = FB \times FA$ .
12. The ratio of incomes of two persons is 9:7 and the ratio of their expenditures is 4:3. If each of them saves Rs. 200 per month, find their monthly incomes.
13. Divide the polynomial  $u(x) = 9x^4 - 4x^2 + 4$  by the polynomial  $v(x) = 3x^2 + x + 1$ . Also, find the quotient and remainder.
14. A dealer sells a toy for Rs. 24 and gains as much percent as the cost price of the toy. Find the cost price of the toy.

### ATTEMPT ANY 12 (TWELVE) QUESTIONS FROM Q. 16 TO Q. 30.

15. A man repays a loan of Rs. 3250 by paying Rs. 20 in the first month and then increases the payment by Rs. 15 every month. How long will it take him to clear the loan?
16. If an isosceles triangle ABC in which  $AB = AC = 6$  cm is inscribed in a circle of radius 9 cm, find the area of the triangle.

