

AE-F

2/2015

**SUBJECT : MATHEMATICS (SET-A)**

Time : 3 Hrs.

M.M.: 100

**General Instructions :**

- (i) Read all questions carefully.
- (ii) The question paper consists of 26 questions divided into three sections - A, B and C.
- (iii) Section-A, comprises of 6 questions of 1 mark each.  
Section-B, comprises of 13 questions of 4 mark each.  
Section-C, comprises of 7 questions of 6 mark each.
- (iv) There is no overall choice. However, internal choice has been given in 4 questions of 4 marks each and 2 questions of 6 marks each. You have to attempt only one of the alternatives in all such questions.
- (v) Use of calculators is not allowed.

**SECTION-A**

- Q1. Find the value of  $\tan 15^\circ$
- Q2. Express  $\frac{1-i}{1+i}$  in the standard form.
- Q3. Find the equation of the side AB of the triangle whose vertices are A(7,-1), B(-2,8) and C(1,2).
- Q4. Find the equation of parabola whose focus is at (-3,0) and directrix is  $x = 3$ .
- Q5. If A (3, -1, 2), B (1, 2, -4), C (-1, 1, 2) and D (1, x, 8) are the vertices of a parallelogram ABCD, find x.
- Q6. Write the contrapositive of the following statement :  
Something is cold implies that it has low temperature

**SECTION-B**

- Q7. Prove that:  $\tan x + \tan (60^\circ + x) + \tan (120^\circ + x) = 3 \tan x$
- Q8. Prove by the principle of mathematical induction:

$$\frac{1}{1 \cdot 3} + \frac{1}{3 \cdot 5} + \frac{1}{5 \cdot 7} + \dots + \frac{1}{(2n-1)(2n+1)} = \frac{n}{2n+1}$$

99. In a survey of 25 people, it was found that 15 people read newspaper A, 12 read newspaper B and 11 read newspaper C. 5 read newspaper A and C, 9 read newspaper A and B, 4 read newspaper B and C and 3 read all the three newspapers. Find the number of people that read

- (a) newspaper B and C but not A.
- (b) newspaper A and B but not C.

Explain the role of media in democracy.

Q10. Find the domain and range of the function  $f(x) = \frac{1}{1-x^2}$ .

Q11. Find the term independent of  $x$  in the expansion of

$$\left(3x^2 - \frac{1}{2x^3}\right)^{10}.$$

Q12. Solve:  $\sin 2\theta + \sin 4\theta + \sin 6\theta = 0$ .

Q13. Evaluate:  $\lim_{x \rightarrow 0} \frac{\tan 2x - \sin 2x}{x^3}$ .

Q14. The English alphabet has 5 vowels and 21 consonants. How many words with two different vowels and 2 different consonants can be formed from the alphabets?

Q15. Find the equation of the ellipse whose centre lies at the origin, major axis lies on y-axis, the eccentricity is  $\frac{4}{5}$  and

the length of the latus rectum is  $\frac{18}{5}$ .

OR

Find the equation of the circle concentric with the circle  $2x^2 + 2y^2 + 8x + 10y - 39 = 0$  and having its area equal to  $16\pi$  square units.

Q16. Find the ratio in which the join of  $A(2, 1, 5)$  and  $B(3, 4, 3)$  is divided by the plane  $2x + 2y - 2z = 1$ . Also, find the coordinates of the point of division.

Q17. How many words can be formed out of the letters of the word 'OBEDIENCE' such that

- (a) there is no restriction
- (b) all vowels are together

Write the importance of Obedience in our life.

OR

A committee of 5 is to be formed out of 6 gents and 4 ladies. In how many ways this can be done, when

- (a) atleast 3 ladies are included
- (b) atmost 2 ladies are included.

Should women be given equal rights? What values are being promoted?

Q18. The ratio of the sums of  $m$  and  $n$  terms of an A.P. is  $m^2 : n^2$ . Show that the ratio of the  $m^{\text{th}}$  and  $n^{\text{th}}$  terms is  $(2m-1) : (2n-1)$ .

OR

If the first and the  $n^{\text{th}}$  terms of a G.P. are  $a$  and  $b$  respectively and if  $P$  is the product of the first  $n$  terms, prove that  $P^2 = (ab)^n$ .

Q19. Two dice are thrown simultaneously. Find the probability of getting:

- (a) an even number as the sum.
- (b) a multiple of 3 as the sum.

OR

A committee of two persons is selected from two men and two women. What is the probability that the committee will have

- (a) no man?
- (b) one man?

### SECTION-C

Q20. Calculate the mean and standard deviation for the following distribution:

Marks	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of Students	3	6	13	15	14	5	4

(3)

Q21. Find the sum to  $n$  terms of the series:

$$1 + 5 + 12 + 22 + 35 + \dots$$

Q22. Find the derivatives of the following functions with respect to  $x$ .

(a)  $\frac{\sec x + \tan x}{\sec x - \tan x}$  (4)

(b)  $(x^2 - 3x + 2)(x + 2)$  (2)

Q23. (a) Prove that:  $\frac{\sin 5x - 2 \sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$ . (4)

(b) Evaluate:  $\sin \frac{7\pi}{12} \cos \frac{\pi}{4} - \cos \frac{7\pi}{12} \sin \frac{\pi}{4}$ . (2)

OR

(a) If  $0 \leq x \leq 2\pi$ , find  $\sin \frac{x}{2}$ ,  $\cos \frac{x}{2}$  and  $\tan \frac{x}{2}$ , when

$$\tan x = \frac{-4}{3}, x \text{ lies in quadrant II.} \quad (4)$$

(b) Prove that:  $\cos 4x = 1 - 8 \sin^2 x \cdot \cos^2 x$ . (2)

Q24. A line is such that its segment between the lines  $2x - y + 2 = 0$  and  $x + y = 9$  is bisected at the point  $(2, 5)$ . Obtain its equation.

OR

Find the equation of the line midway between the parallel lines  $9x + 6y - 7 = 0$  and  $3x + 2y + 6 = 0$ .

Q25. Solve the given system of inequalities graphically:

$$2x + 3y \geq 3 \qquad 3x + 4y \leq 18$$

$$x - 6y \leq 3 \qquad x, y \geq 0$$

Q26. Find the number of ways of selecting 4 cards from a pack of 52 cards. Find the probability of getting:

(a) all the four cards of the same suit.

(b) all the four cards of the same number.

(c) one card from each suit.

(d) all the cards are of the same colour.