MATHEMATICS

2018

Time: 2 Hours 40 Minutes

(V)

3.(i)

OR

OR

4.(i)

Marks: 80

SECTION 'B' (SHORT-ANSWER QUESTIONS)(50)

NOTE: Answer any 10 part questions from this section, selecting at least thee part questions from each question.

COMPLEX NUMBER, ALGEBRA & MATRICES

Solve the complex equation for x and y $(x + 2yi)^2 = xi$: 2.(i)

Solve the complex equation for x and y: OR

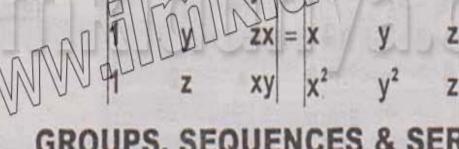
$$X(1 + 2i) + y(3 + 5i) = -3i$$
 (where $i = \sqrt{-1}$)

(ii) Solve the equation:
$$\left(x + \frac{1}{x}\right)^2 = 4\left(x - \frac{1}{x}\right)$$
.

Determine the value of m in the equation that will make (iii) the roots equal: $(m + 1) y^2 + 2(m + 3) y + (2m + 3) = 0$

(iv) If
$$A = \begin{bmatrix} \sin\theta & -\cos\theta \\ \cos\theta & \sin\theta \end{bmatrix}$$
 and $B = \begin{bmatrix} \sin\theta & \cos\theta \\ -\cos\theta & \sin\theta \end{bmatrix}$, then verify that $AB = BA = I_2$

Using properties of determinants, show that:



GROUPS, SEQUENCES & SERIES AND COUNTING PROBLEMS Let $G = \{1, \omega, \omega^2\}$, ω being a complex cube root of unity.

- Show that (G, •) is an abelian group, where 'e' is an ordinary multiplication. If three books are picked at random from a shelf (ii)
- containg 3 novels, 4 books of poems and a dictionary, what is the probability that: the dictionary is selected

one novel and 2 books of poems are selected.

- In how many ways can a party of 5 students and 2
- teachers be formed out of 15 students and 5 teachers? Prove by mathematical induction that $\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \dots$ (iii)

 $+\frac{1}{n(n+1)} = \frac{n}{n+1}$, \forall natural numbers n.

Without using the calculator, find the sum of 21 222 + 232 + + 502. Find the sum of an A.P. of nineteen terms whose middle (iv) term is 10.

Find the value of n so that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may becomes the H.M. between a and b.

Find the first term of a G.P. whose second term is 3 and OR sum to infinity is 12. TRIGONOMETRY

A belt, 24.75 metres long, passes around a 3.5 cm

diameter pulley. The belt makes three complete revolution in a minute. How many radians does the

- wheel turn in two seconds? Draw the graph of $y = \cos x$, where $0 \le x \le \pi$. (ii) Show that $\tan \theta$ is a periodic function of period π . OR In $\triangle ABC$, if a = b = c, then prove that : $r : R : r_1 = 1:2:3$ (iii)
- Solve the equation: $\tan 2\theta \cot \theta = 3$. (iv)
- Prove that $Tan^{-1}\frac{1}{5} + Tan^{-1}\frac{1}{4} = Tan^{-1}\frac{9}{19}$ (v) Prove that: $\sin^{-1} A + \sin^{-1} B = \sin^{-1} (A \sqrt{1-B^2} + B \sqrt{1-A^2})$ OR

SECTION'C' (DETAILED- ANSWER QUESTIO Answer any Two questions from this section, including Question 5 which is compulsory.

Divide 600 rupees among 5 boys, so that their shares 5.(a) are in A.P. and the two smallest shares together make he-seventh of what the other three boys get.

In an H.P., the 10th term is 35 and the 35th term is 25. If OR the last term is 2, find the number of terms. Prove the Law of cosine $a^2 = b^2 + c^2 - 2bc \cos \alpha$ (b) Prove the fundamental law, $cos(\alpha - \beta) = cos \alpha cos \beta +$ OR

sin α sin β. Show that: $\sqrt{2} = 1 + \frac{1}{2^2} + \frac{1.3}{21.2^4} + \frac{1.3.5}{31.2^6} + \frac{1}{21.2^4} + \frac{1}{31.2^6} + \frac{1}{31.2$ 6.(a)

 $X + y + (1 + d) z = 0 \quad (d \neq 0)$

- By using the definition of radian function, if $\sin \theta = 0.6$ 7.(a) and $tan \theta$ is negative, find the remaining trigonometric functions.
- (b) Prove any two of the following: 1-sinθ
- (i) =secθ-tanθ V1+sinθ sinθ cose sin70 - sin50 · sinθ tan -(iii) =tan0

sin20

cos 20

 $\cos 7\theta + \cos 5\theta$ 1+cos 0 Solve and check: (c) Yz + 15 = 0 $Y^2 + z^2 - 34 = 0$