016

Total No. of Questions - 24

Total No. of Printed Pages - 3

Regd. No.

Part - III

MATHEMATICS, Paper - I (A)

(English Version)

Time : 3 Hours *Max. Marks : 75*

Note: This question paper consists of THREE Sections A, B and C.

SECTION - A

10×2=20

I. Very Short Answer Type Questions.

(i) Answer **ALL** questions.

(ii) Each question carries **TWO** marks.

1. If $f : R\ \{0\} \rightarrow R$ is defined by $f(x) = x^3 - \frac{1}{x^3}$, then show that $f(x) + f\left(\frac{1}{x}\right) = 0$

2. Find the domain of the real valued function $f(x) = \frac{1}{(x^2-1)(x+3)}$

3. If $\begin{pmatrix} x-3 & 2y-8 \\ z+2 & 6 \end{pmatrix} = \begin{pmatrix} 5 & 2 \\ -2 & a-4 \end{pmatrix}$, then find the value of x, y, z and a.

4. If ω is complex (non-real) cube root of 1, then show that -

$$\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix} = 0$$

Let $\bar{a} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\bar{b} = 3\hat{i} + \hat{j}$. Find the unit vector in the direction of $\bar{a} + \bar{b}$.

[P.T.O.]

(i) Answer ...

(ii) Each question carries **SEVEN** marks.

18. If $A = \{1, 2, 3\}$, $B = \{\alpha, \beta, \gamma,\}$ $C = \{p, q, r\}$ and $f : A \to B$ ... $g : B \to C$ are defined by $f = \{(1, \alpha), (2, \gamma), (3, \beta)\}$, $g = \{(\alpha, ...$ $(\beta, r), (\gamma, p)\}$, then show that f and g are bijective functions ... $(gof)^{-1} = f^{-1}og^{-1}$

19. Using mathematical induction, show that

$$\frac{1}{1.4} + \frac{1}{4.7} + \frac{1}{7.10} + \cdots \text{ upto n terms} = \frac{n}{3n+1} \; \forall \, n \in N.$$

20. Show that.

$$\begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(ab+bc+ ...$$

21. Solve $x + y + z = 1$, $2x + 2y + 3z = 6$, $x + 4y + 9z = ...$ matrix inversion method.

2. If $\bar{a} = 2\hat{i} + \hat{j} - 3\hat{k}$, $\bar{b} = \hat{i} - 2\hat{j} + \hat{k}$, $\bar{c} = -\hat{i} + \hat{j} ...$ $\bar{d} = \hat{i} + \hat{j} + \hat{k}$, then compute $|(\bar{a} \times \bar{b}) \times (\bar{c} \times ...$

If A, B, C are the angles of a triangle, prove tha...

$\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$

If $r_1 = 2$, $r_2 = 3$, $r_3 = 6$ and $r = 1$, prove that ... $c = 5$.

SECTION - C

III. Long Answer Type Questions.

(i) Answer **ANY FIVE** questions.

(ii) Each question carries **SEVEN** marks.

18. If $A = \{1, 2, 3\}$, $B = \{\alpha, \beta, \gamma,\}$ $C = \{p, q, r\}$ ar
$g : B \rightarrow C$ are defined by $f = \{(1, \alpha), (2, \gamma), (3, \beta$
$(\beta, r), (\gamma, p)\}$, then show that f and g are bijecti
$(gof)^{-1} = f^{-1}og^{-1}$

19. Using mathematical induction, show that
$\frac{1}{1.4} + \frac{1}{4.7} + \frac{1}{7.10} + \cdots$ upto n terms $= \frac{n}{3n+1}$

20. Show that
$$\begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)$$

21. Solve $x + y + z = 1, 2x + 2y + 3z = 6, x$
matrix inversion method.

22. If $\bar{a} = 2\hat{i} + \hat{j} - 3\hat{k}, \bar{b} = \hat{i} - 2\hat{j} + \hat{k}, \bar{c}$
$\bar{d} = \hat{i} + \hat{j} + \hat{k}$, then compute $|(\bar{a} \times \bar{b}$

23. If A, B, C are the angles of a triangle
$\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin$

24. If $r_1 = 2, r_2 = 3, r_3 = 6$ and $r = 1,$
$c = 5.$