Roll No..... **(ONE GRAPH PAPER)**

Total No. of Questions—11] [Total No. of Printed Pages—4

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BUSINESS MATHEMATICS

PAPER—First Term

Maximum Marks—50 Time Allowed—2½ Hours

Note : In case of failures/re-appear cases and fresh private candidates; i.e. candidates appearing for the first time after having passed Secondary School Examination, marks secured out of 50 shall be raised proportionately as if obtained out of 75.

1. (a) For any two sets A and B, prove that :

$$(A \cap B)' = A' \cup B'.$$

(b) If $f(x) = \log\left(\frac{1+x}{1-x}\right)$, show that :

$$f\left(\frac{2x}{1+x^2}\right) = 2f(x).$$

Or

(a) In a Group of 48 people, 22 drink Tea but not Coffee and 34 drink Tea. Calculate how many drink both Tea and Coffee. 3

(b) If $f : R \to R$; $f(x) = \cos x$ and $g : R \to R$; $g(x) = x^3$, find

$$f \circ g\left(\pi/2\right) \text{ and } g \circ f\left(\pi/2\right).$$ 4

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2. (a) If p and q are both positive real numbers and $p > q$, prove that

$$\frac{1}{p} < \frac{1}{q}.$$

(b) In one root of $x^2 - x - \lambda = 0$ is square of the other, find the value of λ.

Or

(a) Solve graphically :

$$x + y < 5, \quad x \geq 1, \quad y \geq 2. \qquad 3$$

(b) If α and β are the roots of the equation $x(2x - 1) = 1$, find the equation, whose roots are $(2\alpha - 1)$ and $(2\beta - 1)$. 4

3. (a) Express $\cos \alpha$ in terms of $\operatorname{cosec} \alpha$.

(b) If $A + B + C = \pi$, prove that :

$$\sin 2A - \sin 2B + \sin 2C = 4 \cos A \sin B \sin C.$$

Or

(a) In any triangle ABC, prove that :

$$(a-b)^2 \cdot \cos^2 \frac{c}{2} + (a+b)^2 \sin^2 \frac{c}{2} = c^2. \qquad 3$$

(b) In any triangle ABC, show that :

$$a \cos A + b \cos B = c \cos (A - B). \qquad 4$$

4. (a) Solve :

$$\cos 4\theta = \sin 3\theta.$$

(b) If $\tan^2 \theta = 1 + 2 \tan^2 \phi$, show that :

$$\cos^2 \phi = 2 \cos^2 \theta.$$

Or

(a) Prove that :

$$\frac{\tan\theta+\sec\theta-1}{\tan\theta-\sec\theta+1}=\frac{1+\sin\theta}{\cos\theta}.$$ 3

(b) Simplify :

$$\tan\frac{3\pi}{20}\tan\frac{4\pi}{20}\tan\frac{5\pi}{20}\tan\frac{6\pi}{20}\tan\frac{7\pi}{20}.$$ 4

5. Prove by the Principle of Mathematical induction

$$1 + 3 + 5 + \ldots\ldots + (2n - 1) = n^2, \quad \forall\, n \in N.$$ 3

6. Solve for x :

$$\log (3x + 2) + \log (3x - 2) = 5 \log 2.$$ 3

7. If 1, ω and ω^2 are the cube toots of unity, then prove that :

$$(1 - \omega + \omega^2)(1 + \omega - \omega^2) = 4.$$ 3

8. Prove that :

$$\frac{\cos 11^\circ+\sin 11^\circ}{\cos 11^\circ-\sin 11^\circ}=\tan 56^\circ.$$ 3

9. If x, y, z are in A.P., show that :

$$(x + 2y - z)(2y + z - x)(z + x - y) = 4xyz.$$ 3

10. (a) Find first four terms of the series :

$$t_n = (-1)^{n+1} \cdot 2^{-n}.$$ 1

(b) Find the sum of the Geometric series :

$$256 + 128 + 64 \ldots\ldots + \text{to 10 terms}.$$ 1

(c) Prove that :

$$(\log a)^2 - (\log b)^2 = (\log ab) \cdot \left(\log \frac{a}{b}\right).$$ 1

(d) Solve the following Inequation :

$$\frac{x-1}{2} \geq 3.$$ 1

11. Choose the correct/most appropriate answer and write it in your Answer-book :

(i) The conjugate of $\left(\frac{1+2i}{3-i}\right)$ is

(a) $1 + 7i$

(b) $1 - 7i$

(c) $\frac{1+7i}{10}$

(d) $\frac{1-7i}{10}$: 1

(ii) The G.M. of the roots of $2x^2 - 3x + 4 = 0$ is

(a) 2

(b) $\sqrt{2}$

(c) ± 3

(d) None of the above. 1

(iii) If A is a finite set having n elements, then the number of elements in P(A) is

(a) n^2

(b) $2n$

(c) 2^n

(d) n^n. 1