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FIRST SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2022

(NEP—OEC)

Mathematics

BUSINESS MATHEMATICS—I

Time : Two Hours Maximum : 60 Marks

Answer **all** *questions.*

I. Answer any *five* of the following. Each question carries 2 marks :

1 Define a set and give one example.

2 Prove that $\frac{1}{1+x^{a-b}}+\frac{1}{1+x^{b-a}}=1$.

3 Define scalar matrix and give one example.

4 Evaluate $\begin{vmatrix} 1 & 0 & 2 \\ 1 & 2 & 5 \\ 6 & 8 & 0 \end{vmatrix}$.

5 Show that $(1-\sin^2\theta)\cdot\sec^2\theta=1$.

6 If $\sin A=\frac{1}{2}$ then find cos 2A.

(5 × 2 = 10 marks)

II. Answer any *four* of the following. Each question carries 5 marks :

7 A town consisting of 50,000 people. 28,000 people likes to read Prajavani, 23,000 people like to read Times of India, 4,000 people read both papers. Find how many people read neither Prajavani nor Times of India.

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

9 Solve the system of linear equations by using Cramer's rule :

$$\begin{aligned} 5x - 7y + z &= 11 \\ 6x - 8y - z &= 15 \\ 3x + 2y - 3z &= 7. \end{aligned}$$

Turn over

10 If $\tan(A - B) = \frac{1}{7}$ and $\tan A = \frac{1}{2}$ then prove that $A + B = 45°$.

11 Prove that $\sin^2\frac{\pi}{8} + \sin^2\frac{3\pi}{8} + \sin^2\frac{5\pi}{8} + \sin^2\frac{7\pi}{8} = 2$.

(4 × 5 = 20 mar

III. Answer any *three* of the following. Each question carries 10 marks :

12 (a) In how many ways can a committee of 3 ladies and 4 gentlemen be appointed fr a meeting consisting of 8 ladies and 7 gentlemen ? What will be the number ways if Mrs. X refuses to serve in a committee having Mr. Y as the member.

(b) If $\log_2 x + \log_4 x + \log_{16} x = \frac{21}{4}$ then find x.

13 (a) The cost of 4 kg. onion, 3 kg. wheat and 2 kg. rice is Rs. 320. The cost of 2 kg. onio 4 kg. wheat and 6 kg. rice is Rs. 560. The cost of 6 kg. onion, 2 kg. wheat and 3 k rice is Rs. 380. Find the cost of each item per kg.

(b) Define the adjoint of a matrix and find the adjoint of $A = \begin{bmatrix} 1 & 2 & 1 \\ 5 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$. II

14 (a) If $x = 1 + 2^{1/3} + 2^{2/3}$ then prove that $x^3 - 3x^2 - 6x - 1 = 0$.

(b) Prove that $\sin 3A = 3 \sin A - 4 \sin^3 A$.

15 (a) Prove geometrically $\sin(A + B) = \sin A \cos B + \cos A \sin B$.

(b) If $\tan\theta = -\frac{3}{4}, \frac{\pi}{2} < \theta < \pi$ then find the value of $\frac{5\cos\theta + 8\tan\theta}{8\sec\theta - 3\operatorname{cosec}\theta}$.

(3 × 10 = 30 mar