SYBSc
SEMESTER III
MATHS II
SAMPLE QUESTIONS

1. The column rank of the following matrix
$$\begin{bmatrix} 1 & 2 & -1 & 3 \\ -3 & 6 & 3 & -2 \end{bmatrix}$$
a) 1 b) 2 c) 3 d) 4

2. Let $T: \mathbb{R}^2 \to \mathbb{R}$ be the linear transformation defined by $T(x, y, z) = 3x - 5y + 2z$. Then the nullity of T is
a) 0 b) 1 c) 2 d) 3

3. $\left(\begin{array}{ccc|c} 1 & -1 & 3 & 8 \\ 0 & 1 & 2 & 7 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 \end{array}\right)$ is an augmented matrix of a system of linear equations.
   a) System is consistent and has unique solution.
   b) System is inconsistent
   c) System has infinity many solution
   d) Can't say anything.

4. Determinant of the matrix $\begin{pmatrix} a & 0 & 0 & 0 \\ b & b & 0 & 0 \\ c & c & c & 0 \\ d & d & d & d \end{pmatrix}$ is
a) $a + b + c + d$ b) $abcd$ c) $abb^2c^3d^4$ d) $a + b^2 + c^2 + d^2$

5. Determinant of a diagonal matrix is
   a) sum of diagonal entries
   b) product of diagonal entries
   c) zero
   d) never zero

6. $Det(2e_1, e_1+3e_2, -e_3)$ where $\{e_1, e_2, e_3\}$ is a standard basis of $\mathbb{R}^3$ is
a) 3 b) 1 c) 6 d) -2

7. . The area of the parallelogram whose vertices are
$A(1,1)$ $B(2,4)$ $C(3,-2)$ $D(4,1)$is
a) 9 sq units b) 27 sq units c) $1/9$sq units d) None of these

8. Which of the following is not an inner product on $\mathbb{R}^2$?$x = (x_1, x_2)$ and $y = (y_1, y_2)$
   a) $\langle x, y\rangle = 2x_1y_1 + 3x_2y_2$
   b) $\langle x, y\rangle = x_1y_1 + x_2y_2$
   c) $\langle x, y\rangle = x_1y_1 - x_2y_2$
   d) $\langle x, y\rangle = x_1y_1 + 4x_2y_2$

9. Consider $f(x) = \sin kx$, where k is some integer $k > 0$. Then norm of f with $\langle f, g\rangle = \int_{-\pi}^{\pi} f(x)g(x)dx$is

   a. 2π b) $\sqrt{\pi}$ c) π d) None of these

10. Let V be a finite dimensional inner product space and W be a subspace of V and $W^{\perp}$be the orthogonal complement of Win V. If dim $V = n$, dim $W = r$, then dim $W^{\perp}$ is

   $a) r$ b)$n - r$ c)n d) None of these