UG-445 BMC–12/BMS–12

B.Sc. DEGREE EXAMINATION —
DECEMBER 2018.

First Year

Mathematics/Mathematics for Computer Applications

TRIGNOMETRY, ANALYTICAL GEOMETRY (3D) AND VECTOR CALCULUS

Time : 3 hours Maximum marks : 75

PART A — (5 × 5 = 25 marks)

Answer any FIVE questions.

1. Express $\cos 5\theta$ interms of $\cos\theta$.

2. Prove that $\sinh^{-1} x = \log_e(x + \sqrt{x^2 + 1})$.

3. Find the angle between the planes $2x - y + z = 6$, $x + y + 2z = 3$.

4. Find the equation of the plane parallel to $2x - 3y + 5z + 12 = 0$ and passing through the point $(2, 3, 1)$.

5. Find the equation of the sphere whose centre $(1,2,3)$ and radius is 4 units.

6. Find the equation of the sphere whose centre $(1,-3,4)$ and which passes through the point $(3,-1,3)$.

7. If $\phi = x^2 + y^2 - z - 1$ find $grad\ \phi$ at $(1, 0, 0)$.

8. If $\vec{F} = x^2 \vec{i} + xy \vec{j}$ evaluate $\int_C \vec{F} \cdot d\vec{r}$ from $(0, 0)$ to $(1, 1)$ along the line $y = x$.

PART B — (5 × 10 = 50 marks)

Answer any FIVE questions.

9. Show that $\dfrac{\sin 6\theta}{\sin\theta} = 32\cos^5\theta - 32\cos^3\theta + 6\cos\theta$.

10. Separate into real and imaginary parts of $\tan(x+iy)$.

11. Find the image of the point $P(2, 3, 5)$ in the plane $2x + y - z + 2 = 0$.

12. Obtain the equation of the plane passing through the points $(2,2,-1)$, $(3,4,2)$ and $(7,0,6)$.

13. Find the shortest distance between the lines $\frac{x-8}{3}=\frac{y+9}{-16}=\frac{z-10}{7}$ and

$$\frac{x-15}{3}=\frac{y-29}{8}=\frac{z-15}{-5}.$$

14. Find the equation of the sphere passing through the points $(1,0,-1)$, $(2,1,0)$, $(1,1,-1)$ and $(1,1,1)$.

15. Find $\nabla\cdot\vec{F}$ and $\nabla\times\vec{F}$ of the vector point function $\vec{F}=xz^3\vec{i}-2x^2yz\vec{j}+2yz^4\vec{k}$ at the point $(1,-1,1)$.

16. If $\vec{F}=3xy\vec{i}-y^3\vec{j}$. Evaluate $\int_C \vec{F}\cdot d\vec{r}$ where C is the curve $y=2x^2$ in the XY plane from $(0,0)$ to $(1,2)$.
