

QUESTION BANK ON ENGINEERING MATHEMATICS-II

(COMMON FOR ALL ENGINEERING BRANCH 1st YEAR)



PREPARED BY

MRS. PADMINI PANIGRAHI

LECTURER IN MATHEMATICS

GOVT. POLYTECHNIC NABARANGPUR

QUESTION BANK FOR ENGG. MATH-II

VECTOR

1. Define Null vector, Parallel vector, Unit Vector (2 marks)

All question 2 to 9 carry 5 marks.

2. If $\vec{u} = 3\hat{i} + 3\hat{j} - 5\hat{k}$ $\vec{v} = \hat{i} - 5\hat{j} + 7\hat{k}$

find $\vec{u} + \vec{v}$ & $\vec{u} - \vec{v}$

3. Find the magnitude and direction of $\vec{u} = 3\hat{i} + 5\hat{j}$

4. $\vec{u} = 2\hat{i} + 4\hat{j} + 5\hat{k}$ $\vec{v} = 3\hat{i} + 2\hat{j} + 7\hat{k}$ find $\vec{u} \cdot \vec{v}$

5. Find the scalar projection of $\vec{u} = 3\hat{i} - 3\hat{j} + 5\hat{k}$ on $\vec{v} = \hat{i} - 3\hat{j} + 7\hat{k}$

6. Find the scalar projection of $\vec{u} = \hat{i} - 2\hat{j} + 3\hat{k}$ on $\vec{v} = \hat{i} + \hat{j} + \hat{k}$

7. $\vec{u} = 2\hat{i} + 3\hat{j} + 5\hat{k}$ & $\vec{v} = \hat{i} + 2\hat{j} + 7\hat{k}$ find $\vec{u} \times \vec{v}$

Find the vector projection of $\vec{v} = \hat{i} + 2\hat{j} + 7\hat{k}$

on $\vec{u} = 2\hat{i} + 3\hat{j} + 5\hat{k}$

8. Find area of a parallelogram whose sides are represented by the vectors $\hat{i} - 3\hat{j} + 5\hat{k}$ and $\hat{i} + \hat{j} + 2\hat{k}$

9. Find area of a triangle whose two sides are represented by the vectors $2\hat{i} - 4\hat{j} + 5\hat{k}$ and $\hat{i} + 4\hat{j} + 3\hat{k}$ (5 marks)

Derivative

2. $\sin x \cdot \cos y + x \cdot y = 0$ find $\frac{dy}{dx}$ (5 marks)

3. If $y = x^x$ find $\frac{dy}{dx}$ (5 marks) 4. If $y = \sin t$ and $x = \cos t$ then find $\frac{dy}{dx}$ (5 marks)

5. Differentiate $3^{\cos x}$ w.r.t $\log x$ (5 marks)

6. Differentiate $\sec^{-1} x$ w.r.t $\cos^{-1} x$ (5 marks)

7. Differentiate $\tan x$ w.r.t e^{x^2} (5 marks)

8. Find the derivative of a^x with respect to $\sec x$. (5 marks)

9. Find the derivative of x^3 with respect to e^x . (5 marks)
10. Find the derivative of $\log x$ with respect to $\tan x$. (5 marks)
11. $y = \tan x$ find $\frac{d^2y}{dx^2}$ or second successive derivative or 2nd order derivative (5 marks)
12. Find the derivative of $\tan^2 x^2 - 2x^2 + 3$ (5 marks)
13. if $z = \sin x \cdot \cos y + \cos x \cdot \sin y$ then find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ (5 marks)

Integration

1. Solve $\int \cos 2x \, dx$ (2 marks)
2. Solve $\int \sin 3x \, dx$ (2 marks)
3. $\int (x + 1)^2 \, dx$ (2 marks)
4. Evaluate $\int (2x + 5)^9 \, dx$ (2 marks)
5. solve $\int x\sqrt{x + 4} \, dx$ (2 marks)
6. evaluate $\int \frac{e^{\tan^{-1} x}}{1+x^2} \, dx$ (5 marks)
7. Evaluate $\int \frac{e^{2x-1}}{e^{2x+1}} \, dx$ (5 marks)
8. solve $\int \frac{\sin x}{\sin x + \cos x} \, dx$ (5 marks)
9. solve $\int \cos^2 x \, dx$ (5 marks)
10. solve $\int \sin^2 x \, dx$ (5 marks)
11. Evaluate $\int \frac{dx}{4-x^2}$ (5 marks)
12. Evaluate $\int \frac{dx}{\sqrt{x^2-3}}$ (5 marks)
13. Evaluate $\int \frac{dx}{\sqrt{x^2-3}}$ (5 marks)
14. Evaluate $\int \frac{(x^3+4x^2+3x-2)}{x+2} \, dx$ (5 marks)

15. solve $\int \frac{x^4+1}{x^2+1} dx$ (5 marks)

16. solve $\int \frac{x+3}{x^2-2x-5} dx$ (5 marks)

17. solve $\int \frac{dx}{(x+1)(x+2)}$ (5 marks)

18. solve $\int \frac{3x-2}{(x+1)^2(x+3)} dx$ (5 marks)

19. solve $\int \frac{x^2}{(x^2+1)(x^2+4)} dx$ (5 marks)

20. solve $\int \frac{x+3}{x^2-2x-5} dx$

21. $\int \frac{dx}{(x+1)(x+2)}$

22. Solve $\int \frac{3x-2}{(x+1)^2(x+3)} dx$ (5 marks)

23. solve $\int \frac{x^2}{(x^2+1)(x^2+4)} dx$ (5 marks)

24. Evaluate $\int e^x \cdot x dx$ (5 marks)

25. Evaluate $\int x \cos x dx$ (5 marks)

26. Evaluate $\int e^x \cdot \cos x dx$ (5 marks)

27. Evaluate $\int \sqrt{t^2 + 2^2} dx$ (5 marks)

28. Solve the following definite integral

$$a. \int_{-0}^{\frac{\pi}{4}} \sin^3 2t \cdot \cos 2t \, dt$$

$$b. \int_0^1 \frac{x}{x^2 + 1} \, dx$$

$$c. \int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \sin^2 x \, dx$$

$$d. \int_0^{\frac{\pi}{2}} \frac{\sin^4 x}{\sin^4 x + \cos^4 x} \, dx$$

$$e. \int_{-2}^4 |x| \, dx$$

$$f. \int_0^4 |x - 1| \, dx$$

$$g. \int_0^4 [x] \, dx$$

$$h. \int_0^2 [x^2] \, dx$$

29. Find area of the region bounded by the curve $x^2 = 4y$ and the lines $y = 2$ and $y = 4$ and the y -axis in the first quadrant

30. Find area bounded by a circle $x^2 + y^2 = 9$.

Differential Equation

1. find order and degree of following equation (2 marks)

$$\frac{dy}{dx} = 1$$

$$\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 - 3y + 2 = 0$$

$$\frac{d^3y}{dx^3} + \left(\frac{dy}{dx}\right)^2 - 3x = 0$$

$$\left(\frac{d^2y}{dx^2}\right)^2 - 3 = 0$$

$$\left(\frac{dy}{dx}\right)^2 + \left(\frac{d^2y}{dx^2}\right)^3 = 1$$

$$\left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^3 - 3y + 2 = 0$$

solve $\frac{dy}{dx} = 1$ (2 marks)

solve $\frac{dy}{dx} + \sin x = 3$ (2 marks)

solve $\frac{dy}{dx} + \sin x = 0$ (2 marks)

Solve $\frac{dy}{dx} + y = \sin x$ (5 marks)

solve $\frac{dy}{dx} + 2y \tan x = \sin x$, $y = 0$ when $x = \frac{\pi}{3}$ (5 marks)