Parul University

Parul Institute of Engineering and Technology

Mathematics-2 (For all branches)
Subject Code: 303191151

Question Bank

1. Solve the initial value problem $\frac{d^2x}{dy^2}+\frac{dx}{dy}-2x=0, x(0)=4, x'(0)=-5$
2. Sovel the Differential Equation $y''-2y'+y=e^x$ using the method of undetermined coefficient.
3. Sovel the initial value problem $y''+y=sin\ 2t,\ y(0)=2, y'(0)=1$ using the method of undetermined coefficient.
4. Sovel the Differential Equation $(D^2+9)y=sec\ 3x$ using the method of variation of parameter.
5. Sovel the Differential Equation $\frac{d^2x}{dt^2}+2\frac{dx}{dt}+x\ =e^{-t}\ log\ t$ using the method of variation of parameter.
6. Sovel the Differential Equation $x^2\frac{d^2y}{dx}+2x\frac{dy}{dx}+3y\ =\ log\ x$
7. Solve the initial value problem $x^2\frac{d^2y}{dx}-3x\frac{dy}{dx}+4y\ =\ x^2,\ y(1)=1, y'(1)$
8. Find the steady state oscillation of the mass spring system generated by the equation

$$y''-3y'+2y=sin3t$$

9. If $\vec{r}=xi+yj+zk$, show that the $\overrightarrow{div\ r}=3$.
10. If $\vec{F}=x^2zi-2y^3z^2j+xy^2zk$, find $div\ F$ at $(1,-1,1)$.
11. Show that the vector $V=(x+3y)i+(y-2z)j+(x-2z)k$ is solenoidal.
12. If $\vec{F}=xz^3i-2x^2yzj+2yz^4k$, find $curl\ F$ at $(1,-1,1)$.
13. Find the magnitude and direction of the vector which measures the greatest rate of increase of the function $2xz-y^2$ at $(1,3,2)$.
14. Find the unit normal to the vector to the surface $x^2+2y^2+z^2=7$ at $(1,-1,2)$.
15. Evaluate the line integral for the vector field $\vec{F}=x^2i-xyj$ from the origin O to the point $P\ (1,1)$,
    - Along the straight-line OP
    - Along the parabola $y^2=x$
16. Verify Green's theorem for $\oint_c[(xy+y^2)dx+x^2dy]$ where, C is bounded by $y=x$ and $y=x^2$.
17. Using Green's theorem, evaluate $\oint_c[(3x^2-8y^2)dx+(4y-6xy)dy]$ where, C is bounded by $y^2=x$ and $y=x^2$.
18. Verify Stokes' s theorem for $\vec{A}=(2x-y)i-yz^2j-y^2zk$, where S is the upper half surface of the sphere $x^2+y^2+z^2=1$ and C is it's boundary.
19. Evaluate $\int_0^\infty e^{-2t}tsin\ 3t\ dt$ by using Laplace transform.
20. Find the $L(e^tt^2\cos 4t)$
21. Find the Laplace transform of $\frac{e^{-t}\sin 2t}{t}$

22. Find the inverse Laplace transform of $\frac{1}{(s^2+a^2)^2}$ by using convolution theorem.
23. Evaluate $L^{-1}(\tan^{-1}(s+1))$

Using Fourier integral representation of the function $f(x) = \begin{cases} 1, & if\ |x| < 1 \\ 0, & if |x| > 1 \end{cases}$ hence

24. Find $L(e^{2t+3}u(t-2) + t^2u(t-1))$.
25. Evaluate $L^{-1}\left(\frac{e^{-2s}}{(s^2+1)(s-4)}\right)$.
26. $y'' + 4y' + 3y = e^{-t}, y(0) = y'(0) = 1$ by using Laplace transform.
27. $y'' + 3y = e^{2t}, y(0) = 0, y'(0) = 1,$
28. Prove that Laplace transform of e^{at} is $\frac{1}{s-a}$.
29. Evaluate $\int_0^2 \int_0^{4-x^2} \frac{xe^{2y}}{4-y}\, dy\, dx$, using the change of order of integration.
30. Evaluate $\int_0^1 \int_{4y}^4 e^{x^2}\, dx\, dy$, using the change of order of integration.
31. Change into the polar coordinate and evaluate $\int_0^1 \int_0^{\sqrt{1-y^2}} (x^2+y^2)\, dx\, dy$.
32. Change into the polar coordinate and evaluate $\int_0^1 \int_x^{\sqrt{2x-x^2}} (x^2+y^2)\, dydx$.
33. Evaluate $\int \int_R \frac{\sin y}{y} dx\, dy$, where R is the region bounded by the lines $x = 0$,$x = y, y = 0$ and $y = \pi$.
34. Evaluate $\int \int_R xy\, dA$ where R is the region bounded by the line $y = 2 - x$ and parabola $y = x^2$ and y-axis $x = 0$ in the first quadrant.
35. Evaluate $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} dz\, dy\, dx$.
36. Solve $y' + y = 0$, using power series.
37. Solve $y'' + 4y = 0$, using power series.
38. Find the power-series solution of $y'' + xy = 0$.
39. Find Fourier cosine integral of $f(x) = e^{-kx}, (x > 0, k > 0)$.
40. Using Fourier integral representation of the function $f(x) = \begin{cases} 1, & if\ |x| < 1 \\ 0, & if |x| > 1 \end{cases}$ hence evaluate $\int_0^\infty \frac{\sin\lambda \operatorname{sincos}\lambda x}{\lambda} d\lambda$ and $\int_0^\infty \frac{\sin\lambda}{\lambda} d\lambda$.
41. Write down formula of the Fourier cosine integral of f(x).
42. Write down formula of the Fourier sine integral of f(x).