PVP 23

Code: 23BS1201

I B.Tech - II Semester – Supplementary Examinations
DECEMBER 2024

DIFFERENTIAL EQUATIONS & VECTOR CALCULUS
(Common for ALL BRANCHES)

Duration: 3 hours   Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

PART – A

1.a)	Find the Integrating factor of $(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^2$.
1.b)	Explain Newton's law of cooling.
1.c)	Obtain differential equation to L-C-R circuit.
1.d)	Find the general solution of the differential equation $(D^3 + D^2 + 4D + 4)y = 0$
1.e)	Form a partial differential equation by eliminating the arbitrary constants $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$
1.f)	Solve $\frac{\partial^3 z}{\partial x^3} - 4\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial x \partial y^2} = 0$
1.g)	Define divergence and curl of a vector point function.
1.h)	Define solenoidal and irrotational vectors.
1.i)	Find the area of a circle of radius 'a' using Green's theorem.

1.j)	Evaluate $\int_0^c \int_0^b \int_0^a (x+y+z)dx\,dydz$

PART – B

					Max. Marks
UNIT-I					
2	a)	Solve the differential equation $\frac{dy}{dx}+\frac{y}{x}=x^3-3$.			5 M
	b)	A body kept in air with temperature 25^0C, cools from 140^0c to 80^0C in 20 minutes. Find when the body cools down to 35^0C.			5 M
OR					
3	a)	Determine the complete solution of the equation. $$(1-x^2)\frac{dy}{dx}-xy=1$$			5 M
	b)	Solve the differential equation $(x^3+y^3+1)dx + xy^2dy=0$			5 M
UNIT-II					
4	a)	Solve $y''-2y'+2y=e^x cosx$			5 M
	b)	Determine the general solution to the equation $$D^2y+3Dy+2y=4cos^2x$$			5 M
OR					
5	a)	Solve $(D^2+4)y=tan2x$			5 M
	b)	Find the Particular integral of $(D^2+2D+1)y=xcosx$			5 M

UNIT-III			
6	a)	Form a Partial differential equation by eliminating the arbitrary functions from $z = f_1(y + 2x) + f_2(y - 3x)$	5 M
	b)	Solve the PDE $\left(D^2 + 4DD' - 5D'^2\right)z = \sin(2x + 3y)$	5 M
OR			
7	a)	Find the solution to the equation $(x^2 - y^2 - z^2)p + 2xyq = 2xz$	5 M
	b)	Determine the general solution to the equation. $p - q = \log(x + y)$.	5 M
UNIT-IV			
8	a)	Determine the constants a, b, c so that the directional derivative of $P=axy^2+byz+cz^2x^3$ at (1,2,-1) has a maximum magnitude 64 in the direction parallel to the z-axis.	5 M
	b)	Show that (i) $div(curl\overrightarrow{F}) = 0$ (ii) $\nabla\left(\frac{1}{r^2}\right) = -\frac{2\vec{r}}{r^4}$	5 M
OR			
9	a)	Find the directional derivative of $\emptyset$ at the point (1,-2,1) in the direction of the normal to the surface $xy^2z = 3x + z^2$ where $\varphi = 2x^3y^2z^4$	5 M
	b)	Find (i) $div(grad\emptyset)$ (ii) $grad(logr)$	5 M
UNIT-V			
10	a)	Evaluate $\int_S \overrightarrow{F}.ds$ $where$ $\vec{F} = 4xi - 2y^2j + z^2k$ and 'S' is the surface bounding the region $x^2+y^2=4$, z=0 and z=3	5 M

	b)	Evaluate $\iint (xdydz + ydzdx + zdxdy)$ over the surface of a sphere of radius 'a'	5 M
OR			
11	Verify Stoke's theorem for the vector field $\overrightarrow{F} = (2x - y)i - yz^2 j - y^2 zk$ over the upper half surface $x^2 + y^2 + z^2 = 1$ bounded by it's projection on the xy-plane		10 M