P P SAVANI UNIVERSITY

Third Semester of B. Tech. Examination

December 2017

SESH2070 Mathematical Methods for Machine Learning

23.11.2022, Wednesday **Time: 10:00 a.m. To 12:30 p.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1	**Answer the Following (Any Five)**	**[05]**	**CO**	**BTL**
(i)	Write a definition of Differential Equation.		**1**	**1/2**
(ii)	Define Exact Differential Equation.		**1**	**1/2**
(iii)	Form a PDE for $z = ax + by + ab$.		**1**	**1/2**
(iv)	Define Bernoulli's Equation.		**1**	**1/2**
(v)	Write Fourier series of odd function.		**2**	**1/2**
(vi)	Define Linear Differential Equation.		**1**	**1/2**
(vii)	Write Euler's Formulae.		**2**	**1/2**
Q - 2 (a)	Solve: $(y^2-x^2)dx + 2xydy = 0$.	**[05]**	**1**	**4**
Q - 2 (b)	Solve: $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = \cos 2x \sin x$	**[05]**	**1**	**4**
	OR			
Q - 2 (a)	Solve: $(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^2$.	**[05]**	**1**	**4**
Q - 2 (b)	Solve the IVP $y'' + 4y = 8e^{-2x} + 4x^2 + 2, y(0) = 2, y'(0) = 2$.	**[05]**	**2**	**4/5**
Q - 3 (a)	Solve: $y'' + 2y' + 3y = 2x^2$.	**[05]**	**1**	**4**
Q - 3 (b)	Find the general solution of $y'' + y = 32x^3$ Using method of Undetermined Coefficients.	**[05]**	**2**	**3/5**
	OR			
Q - 3 (a)	Find the solution of the given PDE: $(4D^3 - 3DD' + D'^3z) = 0$.	**[05]**	**2**	**5**
Q - 3 (b)	Solve: $p(1-q^2) = q(1-z)$.	**[05]**	**2**	**4/5**
Q - 4	**Attempt any one.**	**[05]**		
(i)	Find the Fourier Series of $f(x) = x^3$ in the interval $(-\pi, \pi)$.		**2**	**5**
(ii)	Find the Fourier Series of $f(x) = x^2$ in the interval $(-\pi, \pi)$.		**2**	**5**

SECTION – II

Q - 1	**Answer the Following (Any Five)**	**[05]**		
(i)	Write the Gradient of a Scalar Function.		**4**	**1/2**
(ii)	Find ∇f if $f = x^2 + y^2 + z^2$.		**4**	**1/2**
(iii)	What is Path Independence of Line Integral.		**4**	**1/2**
(iv)	Write Green's Theorem in the XY-plane.		**4**	**1/2**
(v)	If $Curl(f) = 0$ then a vector function f is said to be_____.		**4**	**1/2**
(vi)	Write the formula of Divergence of f.		**4**	**1/2**
(vii)	Write the Directional Derivative of Scalar function.		**4**	**1/2**
Q - 2 (a)	Find a Unit vector normal to the Surface $x^2 + y^2 - z = 10$ at the point (1,1,1).	**[05]**	**4**	**4**
Q - 2 (b)	Determine the constants a and b such that $curl(f)$ is 0 where $f = (2xy + 3yz)i + (x^2 + axz - 4z^2)j + (3xy + 2byz)k$.	**[05]**	**4**	**4**
	OR			

Q - 2 (a)	Find $curl(f)$ at the point $(1,-1,1)$ if, $f = (xyz)i + (3x^2y)j + (xz^2 - y^2z)k$.	**[05]**	**4**	**4**
Q - 2 (b)	Find the Directional Derivative of $f = xy + yz + zx$ at the point (1,2,0) in the direction of vector $i + 2j + 2k$.	**[05]**	**3**	**4**
Q - 3 (a)	Using Green's Theorem Evaluate $\oint_c (xy - x^2)dx + x^2dy$ Where C is the triangle bounded by lines $y = 0$,$x = 1$ and $x = y$.	**[05]**	**3**	**3/5**
Q - 3 (b)	Evaluate $\int_c f\ dr$ along the parabola $y^2 = x$ between the points (0,0) to (1,1). Where $f = (x^2)i + (xy)j$.	**[05]**	**3**	**5**
	OR			
Q - 3	Evaluate $\int_c f\ dr$ Where $f = y^2i + 2xyj$	**[10]**	**3**	**5**
	(i) C is Straight Line from (0,0) to (1,2).			
	(ii) C is the Parabola $y = 2x^2$ from (0,0) to (1,2).			
Q - 4	Attempt any one/two.	**[05]**	**4**	**4**
(i)	Determine the Curvature $X = 3t, Y = 3t^2, Z = 2t^2$ $at\ t = 1$.			
(ii)	Determine the Torsion $X = 3t, Y = 3t^2, Z = 2t^2$ $at\ t = 1$.			

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CO : Course Outcome Number BTL : Blooms Taxonomy Level

Level of Bloom's Revised Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create