

**Day and Date: Tuesday, 18/01/2022**

**Time: 11.00 ap to 12. 30**

**Max. Marks- 50**

**Instructions:**

- i. All Questions are compulsory.
- ii. Figure to the right indicate full marks.
- iii. Use of non-programmable calculator is allowed

BT	CO's	Q. No.		Marks	Weightage
		<b>Q.1</b>	<b>Attempt the following</b>	<b>20</b>	<b>40%</b>
<b>L3</b>	<b>201.1</b>	<b>a</b>	i) Solve $(D^3 - 6D^2 + 11D - 6)y = e^{-2x}$ (3 marks) ii) Solve $(D^2 + 4)y = \sin 2x$ (4 marks)	<b>7</b>	
<b>L3</b>	<b>201.2</b>	<b>b</b>	A box contains 100 transistors, 20 of which are defective. If the transistors are packed in boxes of 10, using Binomial distribution find the number of packets containing) two are defective ii) all are good iii) at least one is defective in a consignment of 10000 packets.	<b>7</b>	
<b>L3</b>	<b>201.3</b>	<b>c</b>	i) Find the Laplace transform of $te^{-2t} \cos 3t$ (3 marks) ii) Find $L^{-1}\left[\frac{3s-1}{s^3+s^2-14s-24}\right]$ (4 marks)	<b>6</b>	
		<b>Q.2</b>	<b>Attempt the following</b>	<b>15</b>	<b>60%</b>
<b>L3</b>	<b>201.4</b>	<b>a</b>	Obtain the lines of regression of y on x and x on y from the following data and hence find the coefficient of correlation. $\begin{matrix} x = & 1 & 2 & 4 & 5 & 6 & 9 & 10 \\ y = & 5.7 & 5.5 & 5.2 & 4.7 & 4.2 & 4.1 & 3.6 \end{matrix}$	<b>7</b>	
<b>L3</b>	<b>201.5</b>	<b>b</b>	<b>If <math>\vec{F} = (3x + 2y + az) \mathbf{i} + (bx - 3y - 2z) \mathbf{j} + (4x + cy + 3z) \mathbf{k}</math> is irrotational, find a, b, c, and find the work done in moving a particle from (1, 2, -4) to (3, 2, 2)</b>  <b>OR</b>	<b>8</b>	
	<b>201.6</b>	<b>b</b>			

			<p>Solve the Laplace equation <math>\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0</math> for following mesh points by Gauss – Seidel method upto two iterations</p> <p>70      40      20      10      0</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>40</td> <td><math>u_1</math></td> <td><math>u_2</math></td> <td><math>u_3</math></td> <td>20</td> </tr> <tr> <td>25</td> <td><math>u_4</math></td> <td><math>u_5</math></td> <td><math>u_6</math></td> <td>30</td> </tr> <tr> <td>10</td> <td><math>u_7</math></td> <td><math>u_8</math></td> <td><math>u_9</math></td> <td>50</td> </tr> </table> <p>0      10      25      50      80</p>	40	$u_1$	$u_2$	$u_3$	20	25	$u_4$	$u_5$	$u_6$	30	10	$u_7$	$u_8$	$u_9$	50		
40	$u_1$	$u_2$	$u_3$	20																
25	$u_4$	$u_5$	$u_6$	30																
10	$u_7$	$u_8$	$u_9$	50																

		<b>Q.3</b>	<b>Attempt the following</b>	<b>15</b>
<b>L3</b>	<b>201.4</b>	<b>a</b>	<p>Fit a second-degree curve <math>y = a + bx + c x^2</math> to the following data</p> <p><math>x = 02 \quad 5 \quad 9 \quad 14</math></p> <p><math>y = 0.32.115.352.5 \quad 130.5</math></p>	7
<b>L3</b>	<b>201.5</b>	<b>b</b>	<p>i) If <math>\vec{F} = (3ax \cosh^3 y + 2y - \sec yz) \mathbf{i} + (3x - a \sinh^3 y + \tan zx) \mathbf{j} + (2x + \operatorname{cosec} x - 6z \cosh y) \mathbf{k}</math> is Solenoidal vector field then find the value of a. (4 marks)</p> <p>ii) If <math>\vec{F} = \nabla \phi</math> where <math>\phi = x^2 y^3 z^4</math>, find <math>\operatorname{Curl} \vec{F}</math> (4 marks)</p> <p><b>OR</b></p> <p><b>201.6</b> <b>b</b> A tightly stretched string of length <math>l</math> with fixed ends is initially in equilibrium position. It is set vibrating by giving each point a velocity <math>v_0 \sin^3 \frac{\pi x}{l}</math>. Find the displacement <math>y(x, t)</math> (8 marks)</p>	8

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