P P SAVANI UNIVERSITY

Fourth Semester of B. Tech. Examination

November 2022

SESH2051 Mathematical Methods for Computation

21.11.2022, Monday **Time: 01:00 p.m. To 03:30 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

			CO	BTL
Q - 1	Solve $(D^2 + 3D + 2)y = xe^x \sin x$.	[05]	2/3	5
Q - 2	The IVP governing the current i flowing in a series RL circuit when a voltage $v(t) = t$ is applied, is given by $iR + L\frac{di}{dt} = t,\ t \geq 0,\ i(0) = 0$ where R and L are constants. Find the current $i(t)$ at time t.	[05]	2/3	3/4
Q - 3	Find the general solution of $y'' - 2y' - 3y = 6e^{-x} - 8e^x$ using method of undetermined coefficients.	[05]	2/3	5
	OR			
Q - 3	Using the method of variation of parameters, solve $(D^2 - 2D + 2)y = e^x \tan x$.	[05]	2/3	3/5
Q - 4	Solve $y^2p - xyq = x(z - 2y)$.	[05]	2/3	5
Q - 5	Form the partial differential equation by eliminating the arbitrary functions from $z = f(x + at)(x - at)$.	[05]	2/3	3
Q - 6	Find the Laplace transform of $f(t) = \{3t^5 - 2t^4 + 4e^{-5t}\}e^{2t}$.	[05]	2	5

SECTION – II

			CO	BTL
Q - 1	Find the half-range sine series of $f(x) = e^{ax}$ in the interval $(0, \pi)$.	[05]	6	3/5
Q - 2	Find Fourier cosine integral of given function $f(x) = e^{-kx}$ where $x > 0, k > 0$	[05]	6	3/5
Q - 3	Find the missing frequency distribution shown that the mean of the distribution is 1.46.	[05]	1/4	2/4

X	0	1	2	3	4	5	Total
Y	46	?	?	25	10	5	200

OR

Q - 3	Calculate Pearson's Coefficient of correlation from the data given below: $N = 10, \sum X = 140, \sum Y = 150, \sum(X - 10)^2 = 180, \sum(Y - 10)^2 = 215, \sum(X - 10)(Y - 10) = 60$.	[05]	1	4
Q - 4	The number of bacterial cells (y) per unit volume in a culture at different hours (x) is given below:	[05]	1	4

x	0	1	2	3	4	5	6	7	8	9
y	43	46	82	98	123	167	199	213	245	272

Calculate the regression line of y on x. Also, estimate y corresponding to $x = 15$ hours.

Q - 5	A factory has two machines A and B. Past records show that the machine A produces 30% of the total output and the machine B, the remaining 70%. Machine A produces 5% defective articles and Machine B produces 1% defective items. An item is drawn at random and found to be defective. What is the probability that it was produced **(i)** by the machine A **(ii)** by the machine B	**[05]**	**5**	**2/ 5**
Q - 6	**(i)** The mean and variance of a binomial distribution are 4 and $\frac{4}{3}$ respectively. Find $P(X \leq 1)$	**[05]**	**5**	**5/ 6**
	(ii) Suppose $P(X = 0) = 1 - P(X = 1)$. If $E(X) = 3Var(X)$, find $P(X = 0)$.			

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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