

Seat No.	
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**S.Y. B. Tech. (Civil) (Semester - III) (CBCS)**  
**Examination, November - 2019**  
**ENGINEERING MATHEMATICS - III**  
**Sub. Code : 73197**

Day and Date : Saturday, 23 - 11 - 2019

Total Marks : 70

Time : 10.00 a.m. to 12.30 p.m.

- Instructions :
- 1) Attempt any three questions from each section.
  - 2) Figure to the right indicate full marks.
  - 3) Use of non-programmable calculator is allowed.

**SECTION - I**

Q1) a) Solve  $\frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 4y = e^{2x}$ . [6]

b) Solve  $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = x^2$ . [6]

Q2) a) Find the angle between the normals to the surfaces  $x^2y + 2xz = 4$  at  $(2, -2, 3)$  and to  $x^3 + y^3 + 3xyz = 3$  at  $(1, 2, -1)$ . [6]

b) Prove that the vector  $\vec{F} = (x + 2y + az)i + (bx - 3y - z)j + (4x + cy + 2z)k$  is solenoidal and determine the constants  $a, b, c$  if  $\vec{F}$  is irrotational. [5]

Q3) a) Fit a straight line to the following data [5]

x	1	2	3	4	6	8
y	2.4	3	3.4	4	5	6

b) From the following data fit a curve  $y = ab^x$  [6]

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.5

Q4) Attempt any TWO from the following

a) Solve  $x^3 \frac{d^3 y}{dx^3} + 2x^2 \frac{d^2 y}{dx^2} + 2y = 10 \left( x + \frac{1}{x} \right)$ . [6]

b) Prove that  $\nabla \cdot \left( \frac{\vec{r}}{r^3} \right) = 0$ . [6]

c) Find the equation of line of regression of  $y$  on  $x$  for the following data:

$x$	80	45	55	56	58	60	65	68	70	75	85
$y$	82	56	50	48	60	62	64	65	70	74	90

[6]

### SECTION - II

Q5) a) If in a lot of 500 solenoids 60 are defective, find the probability that there will be 0, 1, 2 defective solenoids in a random sample of 20 solenoids. [6]

b) Fit a Poisson distribution to the following data [6]

$x =$	0	1	2	3	4
$y =$	112	63	20	4	1

Q6) a) Find the Laplace transform of  $e^{-4t} \int_0^t u \sin 3u \, du$  [6]

b) Obtain  $L^{-1} \left[ \frac{2s+3}{s^3+6s^2+11s+6} \right]$  [5]

Q7) a) Apply Simpson's  $\frac{1}{3}$  rule to find the value of  $\int_0^1 \frac{dx}{1+e^{-x}}$  dividing the range into 10 equal parts. [6]

b) Evaluate  $\int_{-3}^3 x^4 \, dx$  by Trapezoidal rule using 12 intervals and compare with exact value. [5]

Q8) Attempt any TWO of the following

[12]

- a) The income distribution of a group of 10000 persons was found to be normal with mean Rs. 750 and standard deviation Rs. 50. What percentage of this group had income i) exceeding Rs. 668 ii) exceeding Rs. 832?

(Given : Area under standard normal curve between ordinates at  $\pm 1.64$  is 0.899)

- b) Using convolution theorem find the inverse Laplace transform of  $\frac{1}{s(s^2 + 4)}$

- c) Evaluate  $\int_0^{\pi/2} \frac{\sin x}{x} dx$  by Trapezoidal rule using 9 intervals.

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