SP - 10

Total No. of Pages : 3

Seat No.	

S.Y. B.Tech. (Civil Engineering) (Semester - III) (CBCS)
Examination, January - 2024
ENGINEERING MATHEMATICS - III
Sub. Code : 73197

10657

Day and Date : Tuesday, 02 - 01 - 2024 **Total Marks : 70**

Time : 10.30 a.m. to 1.00 p.m.

Instructions :
1) **Attempt any three questions from each section.**
2) **Figures 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 $(D^2 - D + 1)y = x^3 - 3x^2 + 1$. **[6]**

Q2) a) Find unit tangent vector to the curve $x = t$, $y = t^2$, $z = t^3$ at $t = 1$. **[5]**

b) Find the directional derivative of $\phi = xy^2 + yz^3$ at the point $(2, -1, 1)$ in the direction of the normal to the surface $x\log z - y^2 = -4$ at the point $(-1, 2, 1)$. **[6]**

Q3) a) Find the regression coefficients and the coefficient of correlation from the data,

$N = 12$, $\Sigma x = 120$, $\Sigma y = 432$, $\Sigma xy = 4992$, $\Sigma x^2 = 1392$, $\Sigma y^2 = 18252$. **[5]**

b) Fit a straight line to the following data & estimate the value of y corresponding to $x = 6$. **[6]**

x	0	5	10	15	20	25
y	12	15	17	22	24	30

P.T.O.

Q4) Attempt any Two of the following.

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

b) Prove that, $\bar{F} = (x + 2y + az)i + (bx - 3y - z)j + (4x + cy + 2z)k$ is solenoidal and determine the constants a, b, c if $\bar{F}$ is irrotational. **[6]**

c) Fit a least square geometric curve of the form $y = ab^x$ to the following data: **[6]**

Year(x)	1951	1952	1953	1954	1955	1956	1957
Production tons(y)	201	263	314	395	427	504	612

SECTION - II

Q5) a) If mean & variance of a Binomial distribution are 4 & 2 respectively, find the probability of **[6]**

i) Exactly 2 successes

ii) Less than 2 successes

iii) atleast 2 successes

b) It is 1 in 1000 that an article is defective. There are in a box 100 articles of these type. Assuming Poisson distribution find the probability that the box contains **[6]**

i) No defective

ii) Two or more defective

Q6) a) Find the Laplace transform of $\cosh 2t.\ \cos 2t$. **[5]**

b) Using Convolution theorem, find the inverse laplace transform of $\frac{1}{(s-1)(s^2+4)}$. **[6]**

10657

Q7) a) Evaluate $\int_0^{\pi/2} \sin x \, dx$ by using Trapezoidal rule by dividing the interval into 4 equal sub intervals. **[5]**

b) Evaluate $\int_0^6 \frac{dx}{1+x}$ using Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule by dividing the interval into 6 equal sub intervals. **[6]**

Q8) Attempt any two.

a) If the mean life time and standard deviation of battery cells are 12 hrs and 3 hrs. What % of batteries will have life **[6]**

i) Between 10 and 14 hrs.,

ii) More than 15 hrs.

(Given : For S.N.V. z area from $z = 0$ to $z = 0.67$ is 0.2486, that from $z = 0$ to $Z = 1$ is 0.3413 that from $z = 0$ to $z = 2$ is 0.4772]

b) Find the Laplace transform of f(t) and $f'(t)$ where $f(t) = \begin{cases} t, 0 < t < 3 \\ 6, t > 3 \end{cases}$.**[6]**

c) Find the approximate value of $\int_0^6 e^x dx$ by using Simpson's $\left(\frac{3}{8}\right)^{th}$ rule by dividing the interval into 6 sub intervals. **[6]**

♦ ♦ ♦

10657