

SL-235

Total No. of Pages : 3

Seat No.	
----------	--

S.E. (Civil Engg.) (Semester-III) (Revised)

Examination, May - 2017

ENGINEERING MATHEMATICS-III

Sub. Code : 63338

Day and Date : Friday, 12-05-2017

Total Marks : 100

Time : 02.00 p.m. to 5.00 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Use of Calculator is allowed.

SECTION-I

Q1) Solve any three of the following. [18]

- a) Solve $(D^3 + D^2 + D + 1)y = \cos^2 x$
- b) Solve $(D^2 - 2D + 1)y = xe^x \sin x$
- c) Solve $(D^3 - 6D^2 + 12D - 8)y = x^2 + 1$
- d) A cantilever beam of length l and weighing w/b per unit is subjected to a horizontal compressive force P applied at the free end, satisfies the

differential equation $\frac{d^2 y}{dx^2} + n^2 y = -\frac{Wn^2 x^2}{2P}$, where $n^2 = \frac{P}{EI}$

Taking the origin at the free end and y axis upwards, find the maximum deflection.

Q2) Attempt any two of the following. [16]

- a) Find the directional derivative of $F = x^2 y^2 z^2$ at the point $(1, 1, -1)$ in the direction of the tangent to the curve $x = e^t$, $y = 2\sin t + 1$, $z = t - \cos t$ at $t=0$.
- b) Prove that (i) $\text{grad } r^n = nr^{n-2} \bar{r}$ (ii) $\text{div}(\bar{r} / r^3) = 0$
- c) Show that the vector field represented by $\bar{F} = (y^2 + 2xz^2)\mathbf{i} + (2xy - z)\mathbf{j} + (2x^2z - y + 2z)\mathbf{k}$ is irrotational but not solenoidal. Also obtain its scalar potential.

P.T.O.

Q3) Attempt any two of the following.

a) Fit a second degree parabola to the following data

x:	0	1	2	3	4
y:	-4	-1	4	11	20

b) Fit the curve $y = ab^x$ to the following data

x:	50	450	780	1200	4400	4800	5300
y:	28	30	32	36	51	58	69

c) Find the two lines of regression for the following data

x:	4.3	4.5	5.9	5.6	6.1	5.2	3.8	2.1
y:	12.6	12.1	11.6	11.8	11.4	11.8	13.2	14.1

SECTION-II

Q4) Attempt any two of the following.

[16]

a) 10% of the tools produced in a certain manufacturing process turn out to be defective

i) Find the probability that in a sample of 10 tools chosen at random

1) exactly two are defective 2) exactly three are defective

ii) Find the probability that out of 20 tools selected at random there are

1) exactly two are defective 2) at least two are defective.

b) The customer accounts of a certain departmental store have an average balance of Rs. 120 and standard deviation of Rs. 40. Assuming the distribution of accounts balance is normal find the proportion of accounts

i) over Rs. 150 ii) between Rs. 100 & Rs. 150

iii) between Rs. 60 & Rs. 90 iv) below Rs. 60

Given: for S.N.V.z, the area from $z = 0$ to $z = 0.75$ is 0.2734, the area from $z = 0$ to $z = 0.5$ is 0.1916, the area from $z = 0$ to $z = 1.5$ is 0.4332

c) i) If the probability density function of a discrete random variable x which assumes the values x_1, x_2, x_3 such that $P(x_1) = 2P(x_2) = 3P(x_3)$. Obtain the probability distribution of x .

ii) Verify whether the following function defines a probability distribution or not.

$$f(x) = \frac{1}{2} e^{-|x|} \quad \text{for } -\infty < x < \infty$$

Q5) Attempt any three of the following.

- Find the Laplace transform of $t e^t \sin 2t \cos t$
- Find the Laplace transform of $\frac{(1-\cos 3t)}{t}$
- Find the inverse Laplace transform of $\frac{s^2 + 16s - 24}{s^4 + 20s^2 + 64}$
- Solve the following differential equation using Laplace transform

$$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 8y = 1 \quad \text{Where } y(0) = 0, y'(0) = 1$$

Q6) Attempt any two of the following.

[16]

- Evaluate $\int_0^{1+i} z^2 dz$ along
 - the line $y = x$,
 - the parabola $x = y^2$.
- Show that $u = \cos x \cosh y$ is a harmonic function and find its harmonic conjugate and corresponding analytic function.
- Evaluate $\int_C \frac{e^{3z}}{z-i} dz$ where C is the curve $|z-2| + |z+2| = 6$

→ → →

SUK-TKT