

S -2000

Total No. of Pages :4

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

S.E. (Civil)(Engineering) (Semester - III) Examination,

December - 2015

ENGINEERING MATHEMATICS (Paper - III)

Sub. Code : 63338

Day and Date :Monday, 07 - 12 - 2015

Total Marks :100

Time : 10.00 a.m. to 01.00 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Figures to the right indicates full marks.
 - 3) use of calculator is allowed.

SECTION - I

Q1) Solve any three of the following

[18]

a) Solve $(D^3 + 1) y = \cos 2x + e^{2x}$

b) Solve $(D^3 + 2D^2 + D) y = x^2 + x$

c) Solve $(D^2 + a^2) y = \sec ax$

d) The deflection of a strut of length l with one end ($x = 0$) built in and the other supported and subjected to end thrust P , satisfies the differential

equation $\frac{d^2y}{dx^2} + a^2y = \frac{a^2R(l-x)}{P}$, where $a^2 = \frac{P}{EI}$

Find the equation of the deflection curve.

Q2) Attempt any two of the following.

[16]

- a) Find the directional derivative of the divergence of $\vec{F} = x^2\vec{i} + xy^2\vec{j} + z^2\vec{k}$ at the point $(2,1,2)$ in the direction of the outer normal to the sphere $x^2 + y^2 + z^2 = 9$.

P.T.O.

- b) Prove that $\text{div} \left[\frac{F(r) \bar{r}}{r} \right] = \frac{1}{r^2} \frac{d}{dr} [r^2 f(r)]$ where $\bar{r} = xi + yj + zk$
- c) Show that the vector field represented by $\bar{F} = (y \sin z - \sin x)i + (x \sin z + 2yz)j + (xy \cos z + y^2)k$ is irrotational but not solenoidal. Also obtain its scalar potential.

Q3) Attempt any two of the following [16]

- a) Fit a second degree parabola to the following data

x:	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y:	1.1	1.3	1.6	2.0	2.7	3.4	4.1

- b) Fit the curve $y = ae^{bx}$ to the following data

x =	1	5	7	9	12
y =	10	15	12	15	21

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

x =	152	114	138	154	144	153	141	117	156
y =	194	300	414	594	676	549	320	483	481

SECTION - II

Q4) Attempt any Two of the following [16]

- a) i) Using Poisson distribution find the probability that ace of spade will be drawn from a pack of well shuffled cards at least once in 104 consecutive draws.
- ii) Find the value of k if the following function is probability density function where $f(x) = kx^4 e^{-x/2}$ for $0 \leq x < \infty$

- b) In a sampling the mean number of defective bolts manufactured by a machine in a sample of 20 is 2. Determine the expected number of samples out of 500 such samples to contain
- no defective
 - one defective
 - two defective
 - at least two defective bolts.
- c) 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
- over Rs. 150
 - between Rs. 100 & Rs. 150
 - between Rs. 60 & Rs. 90
 - 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.

Q5) Attempt any Three of the following

[18]

- Find the Laplace transform of $te^{-3t} \cos 2t$.
- Evaluate $\int_0^{\infty} \frac{\cos 6t - \cos 4t}{t} dt$ using laplace transform.
- Find the inverse laplace transform of $\frac{s^2 + 1}{s^3 + 3s^2 + 2s}$
- Solve the following differential equation using laplace transform

$$(D^2 - D - 2)y = 20\sin 2t \text{ with } y(0) = 1, y'(0) = 2 \text{ where } D \frac{d}{dt}$$

Q6) Attempt any Two of the following [16]

a) Show that the function $u = \sin x \cosh y + 2 \cos x \sinh y + x^2 - y^2 + 4xy$ satisfies Laplace's equation and find its corresponding analytic function $f(z) = u + iv$.

b) Evaluate $\int_C \frac{e^{3z}}{z-i} dz$ where C is the curve $|z-2| + |z+2| = 6$.

c) Evaluate $\int_0^{1+i} z^2 dz$ along

- i) the line $y = x$
- ii) the parabola $x = y^2$

