Seat No. Total No. of Pages :4

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 = secax

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 defelection curve.

Q2) Attempt any two of the following.

[16]

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

S - 2000

- b) Prove that div $\left[\frac{F(r)\overline{r}}{r}\right] = \frac{1}{r^2} \frac{d}{dr} \left[r^2 f(r)\right]$ where $\overline{r} = xi + yj + zk$
- c) Show that the vector field represented by $\overline{F} = (y\sin z \sin x)i + (x\sin z + 2yz)j + (xy\cos z + y^2)k$ 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

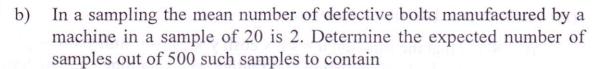
c) Find the two lines of regression for the following data

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 $f(x) = kx^4e^{-x/2}$ for $0 \le x < \infty$



- i) no defective
- ii) one defective
- iii) two defective
- iv) 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
 - 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.

Q5) Attempt any Three of the following

[18]

- a) Find the Laplace transform of te^{-3t} cos 2t.
- b) Evaluate $\int_{0}^{\infty} \frac{\cos 6t \cos 4t}{t}$ dt using laplace transform.
- c) Find the inverse laplace transform of $\frac{s^2 + 1}{s^3 + 3s^2 + 2s}$
- d) 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

- 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 $x = y^2$



 $(D^1 \cdot D - 2)$ y = 20sin2t with y(0) = 1, y'(0) = 2 where $D \frac{d}{dt}$