Total No. of Questions—8]

[Total No. of Printed Pages—5

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S.E. (Comp. & IT) (Second Semester) EXAMINATION, 2019 GINEERING MATHEMATICS—III

(2015 **PATTERN**)

Time: Two Hours

Maximum Marks: 50

- **N.B.** :— (i) Neat diagrams must be drawn wherever necessary.
 - (ii) Figures to the right indicate full marks.
 - (iii) Use of electronic pocket calculator is allowed.
 - Assume suitable data if necessary.
- Solve any two differential equations: 1.

[8]

(i)
$$\frac{d^2y}{dx^2} + 7\frac{dy}{dx} - 2y = e^{4x}\cosh 2x$$

(ii)
$$x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 3y = x^2 \sin(\log x)$$

- (iii) $\frac{d^2y}{dx^2} 8\frac{dy}{dx} + 16y = \frac{e^{4x}}{x^6}$, by using the method of variation $\int_0^\infty f(x) \sin \lambda x \, dx = \begin{cases} 1 - \lambda, & 0 \le \lambda \le 1 \\ 0, & \lambda > 1 \end{cases}$ of parameters.
- Solve the integral equation: (*b*)

[4]

$$\int_0^\infty f(x) \sin \lambda x \ dx = \begin{cases} 1 - \lambda, & 0 \le \lambda \le 1 \\ 0, & \lambda > 1 \end{cases}$$

P.T.O.



- A capacitor of 10^{-3} farads and inductor of (0.4) henries are **2**. (a)connected in series with an applied emf 20 volts in an electrical circuit. Find the current and charge at any time t. [4]
 - Solve any one of the following: (*b*) [4]
 - Obtain $z[ke^{-k}], k \ge 0$
 - (c)

$$y_{k+1} + \frac{1}{2}y_k = \left(\frac{1}{2}\right)^k$$

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- Solve the difference equation : $y_{k+1} + \frac{1}{2}y_k = \left(\frac{1}{2}\right)^k$ where $y_0 = 0$, $k \ge 0$.

 The first three moments of a distribution about the value 2 **3.** (a)are 1, 16 and -40. Find the first three central moments, standard deviation and β_1 .
 - Fit a straight line of the form X = aY + b to the following (*b*) data by the least square method:

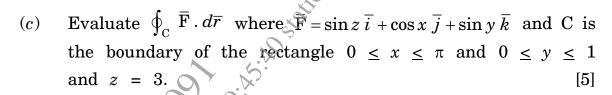
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X			Y	5.0
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(c) On an average, there are 2 printing mistakes on a page of a book. Using Poisson distribution, find the probability that a randomly selected page from the book has at least one printing mistake. [4]

Or

- 4. (a) 200 students appeared for an examination. Average marks were 50% with standard deviation 5%. How many students are expected to score at least 60% marks assuming that marks are normally distributed. [Given: Z = 2, A = 0.4772]. [4]
 - (b) On an average, a box containing 10 articles is likely to have 2 defectives. If we consider a consignment of 100 boxes, how many of them are expected to have at the most one defective?
 - (c) Find the regression equation of Y on X for a bivariate data with the following details. n=25, $\sum_{i=1}^{n} x_i = 75$, $\sum_{i=1}^{n} y_i = 100$, $\sum_{i=1}^{n} x_i^2 = 250$, $\sum_{i=1}^{n} y_i = 500$, $\sum_{i=1}^{n} x_i y_i = 325$. [4]
- 5. (a) Find the directional dervative of $\phi(x,y,z) = xy^3 + yz^3$ at the point (2, -1, 1) in the direction of vector $\overline{i} + 2\overline{j} + 2\overline{k}$. [4]
 - (b) Show that $\overline{F} = (x^2 yz)\overline{i} + (y^2 zx)\overline{j} + (z^2 xy)\overline{k}$ is irrotational. Hence find the scalar potential ϕ such that $\overline{F} = \nabla \phi$. [4]



(i)
$$\nabla \cdot \left[r \nabla \left(\frac{1}{rn} \right) \right] = \frac{n(n-2)}{r^{n+1}}$$
(ii) $\nabla^2 f(r) = f''(r) + \frac{2}{r} f'(r)$.

(ii)
$$\nabla^2 f(r) = f''(r) + \frac{2}{r}f'(r)$$
.

(b) Find the directional derivative of $\phi = xy^2 + yz^3$ at (1, -1, 1) towards the point (2, 1, -1). [4]

$$(c) \quad \text{If} : \qquad \qquad [5]$$

$$\overline{F} = (2xy + 3z^2)\overline{i} + (x^2 + 4yz)\overline{j} + (2y^2 + 6xz)\overline{k}$$

Evaluate:

$$\int_{
m C} \overline{
m F} \,.\, d\overline{r}$$

where C is the curve x = t, $y = t^2$, $z = t^3$ joining the points (0, 0, 0) and (1, 1, 1).

- Determine the analytic function f(z) 4xy 3x + 2**7.** (a) 4xy - 3x + 2.
 - Find the bilinear tranformation which maps the point (*b*) z=i, -1, 1 into the point $w=0, 1 \infty$. [4]

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Evaluate: (c)

$$\int_{\mathcal{C}} \frac{3z+4}{(z-1)(z-2)} dz,$$

where C is the circle
$$|z-1| = \frac{3}{2}$$
.

- Determine the analytic function f(z) = u + iv if $u = x^2$ $y^2 2xy 2x y 1.$ [4] 8. (*a*)
 - Under the transformation $w = \frac{1}{z}$, find the image of |z 3i| = 3. (*b*)

(*c*) Evaluate:

$$\int_{\mathcal{C}} \frac{zdz}{(z-1)(z-3)}$$

where C is the circle
$$|z| = \frac{3}{2}$$
. [5]

[4]

[5]