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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.

- Figures to the right indicate full marks.
- Use of electronic pocket calculator is allowed.
- Assume suitable data if necessary.
- Solve any two differential equations: 1. (*a*)

[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 of parameters.
- Solve the integral equation: (*b*)

[4]

of parameters. the integral equation :
$$\int_0^\infty f(x) \sin \lambda x \ dx = \begin{cases} 1-\lambda, & 0 \le \lambda \le 1 \\ 0, & \lambda > 1 \end{cases}$$

P.T.O.



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

[4]

- (i) Obtain $z[ke^{-k}], k \ge 0$
- (ii) Obtain $z^{-1} \left[\frac{8z}{(z-1)(z-2)} \right], |z| > 2, k \ge 0$.
- (c) Solve the difference equation:

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

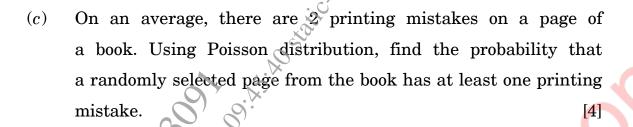
where $y_0 = 0$, $k \ge 0$.

- 3. (a) The first three moments of a distribution about the value 2 are 1, 16 and -40. Find the first three central moments, standard deviation and \$\beta_1\$.
 - (b) Fit a straight line of the form X = aY + b to the following data by the least square method:

- L		
X.	Y	15. K
2	2	20) Six
5	3	3.00
8	4	
11	5	
17	7	
	(

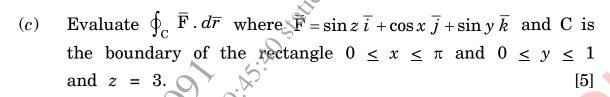
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20



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, $\sum_{i=1}^{n} x_i = 75$, $\sum_{i=1}^{n} y_i = 100$, $\sum_{i=1}^{n} x_i^2 = 250$, $\sum_{i=1}^{n} y_i^2 = 500$, $\sum_{i=1}^{n} x_i y_i = 325$. [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]



[4]

Or

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

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

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

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

Evaluate:

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

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

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

Evaluate: (c)

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

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

[5]

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

(*c*) Evaluate:

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

The state of the s where C is the circle |z|

[4]