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Seat No.

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## S.E. (Computer Engineering/IT) (II Sem.) EXAMINATION, 2017 ENGINEERING MATHEMATICS—III

## (2015 **PATTERN**)

Time: Two Hours

Maximum Marks: 50

- N.B. :— (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right indicate full marks.
  - (iv) Your answers will be valued as a whole.
  - (v) Use of electronic pocket calculator is allowed.
  - (vi) Assume suitable data, if necessary.
- **1.** (a) Solve any two of the following:
  - (i)  $\frac{d^2y}{dx^2} y = \frac{2}{1 + e^x}$  (use method of variation of parameters)
  - (ii)  $(D^2-4)y = e^{4x} + 2x^3$
  - (iii)  $(2x+1)^2 \frac{d^2y}{dx^2} 2(2x+1) \frac{dy}{dx} 12y = 24x$

[8]

(*b*) Solve the following integral equation using Fourier transform: [4]

$$\int_0^\infty f(x)\sin \lambda x d\lambda = 1 - \lambda, \ 0 \le \lambda \le 1$$
$$= 0 \quad , \quad \lambda \ge 1$$
$$Or$$

An electrical circuit consists of an inductance 0.1 henry, a 2. (a) registance R of 20 ohms and a condenser of capacitance C of 25 microfarads. If the differential equation of electric circuit [4]

$$L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = 0,$$

then find the charge q and current i at any time t, given that when t = 0, q = 0.05 columbs and  $i = \frac{dq}{dt} = 0$ .

- Solve any one: (*b*) [4]
  - Find: (i)

$$z^{-1} \left\{ \frac{1}{(z-4)(z-5)} \right\}$$

by inversion integral method.

Find z transform of: (ii)

$$f(k) = (k+1) a^k, k \ge 0.$$

Using z transform, solve the following difference equation: [4] (c)

$$f(k+1) + \frac{1}{2} f(k) = \left(\frac{1}{2}\right)^k, \quad k \ge 0$$

$$f(0) = 0.$$

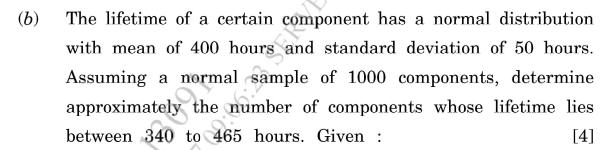
<b>3.</b>	(a)	The first four moments of a distribution about the value 4
		of the variable are -1.5, 17, -30 and 108. Find the central
		moments,
	( <i>b</i> )	By the method of least squares, find the straight line that
		best fits the following data: [4]

best fits t	he following	data :	
3	x x		y
	1		14
33	2		27
7.3)	3		40
N.	4	0	55
7	5	00	68

- (c) There is a small chance of 1/1000 for any computer produced to be defective. Determine in a sample of 2000 computers, the probability:
  - (i) no defective and
  - (ii) 2 defectives.

Or

- 4. (a) Team A has a probability of  $\frac{2}{3}$  of winning whenever the team plays a particular game. If team A plays 4 games, find the probability that the team wins: [4]
  - (i) exactly two games and
  - (ii) at least two games.



$$Z = 1.2 \text{ Area} = 0.3849$$

$$Z = 1.3$$
 Area = 0.4032.

(c) Calculate the coefficient of correlation for the following data: [4]

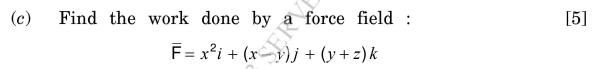
$\boldsymbol{x}$	$\boldsymbol{y}$
10	18
14	6 12
18	24
22	6
22	30
30	36

**5.** (a) Find the directional derivative of a function :  $\phi = 2x^2 + 3y^2 + z^2 \quad \text{at } (2, 1, 3)$ 

in the direction of (i + j + k).

(b) Show that the vector field : [4]  $\overline{F} = (x+2y+4z)i + (2x-3y-z)j + (4x-y+2z)k$ 

is irrotational and hence find a scalar potential function  $\bar{\mathbb{F}}$  such that  $\bar{\mathsf{F}} = \nabla \varphi$ .



along a straight line from (0, 0, 0) to (2, 1, 2).

Find the directional derivative of : 6. [4](a)  $\phi = 4xz^3 - 3x^2y^2z$  at (1, 1, 1)

in the direction of a vector 3i-2j+k.

- Show that (any one): [4](*b*)
  - $\nabla \left( \frac{\overline{a}.\overline{r}}{r^3} \right) = \frac{\overline{a}}{r^3} \frac{3(\overline{a}.\overline{r})\overline{r}}{r^5}$

where  $\bar{a}$  is a constant vector.

- Evaluate the integral (c) [5]

along the curve x = y = z = t from t = 0 to t = 2 where  $\overline{\mathsf{F}} = (x^2 + yz)i + (y^2 + zx)j + (z^2 + xy)k$ 

7. (a) If 
$$u = 3x^2y - y^3,$$
 find  $v$  such that  $f(z) = u + iv$  is analytic. (b) Evaluate: [5] 
$$\frac{z+4}{(z+1)(z+2)} dz,$$
 where C is the circle  $|z| < 3$ .

find v such that f(z) = u + iv is analytic.

(b) Evaluate: [5]

$$\frac{z+4}{(z+1)(z+2)} \frac{dz}{(z+2)}$$

where C is the circle |z| < 3.

Find the bilinear transformation which maps the points (c) (1, i, -1) from the z plane into the points (i, 0, -i) of the [4]w plane.

 $\mathbf{If}$ 8. [4](a)

$$u = 3x^2 - 3y^2 + 2y,$$

find v such that f(z) = u + iv is analytic. Determine f(z) in terms of z.

Evaluate: (*b*) [5]

$$\int_{C}^{E_0} \frac{Az^2 + z}{z^2 - 1} dz$$

wehre C is the contour  $|z-1| = \frac{1}{2}$ 

Find the map of straight line y = x under the transformation (c)

$$w = \frac{z-1}{z+1}.$$

$$(4)$$