Total No. of Questions—8]

[Total No. of Printed Pages—6

Seat		b
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[5152]-566

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

(2015 **PATTERN**)

Time: Two Hours

Maximum Marks: 50

- Answer Q. No. 1 or Q. No. 2, Q. No. 3 or N.B. :-Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
 - Neat diagrams must be drawn wherever necessary.
 - Figures to the right indicate full marks. (iii)
 - Your answers will be valued as a whole. (iv)
 - Use of electronic pocket calculator is allowed. (v)
 - Assume suitable data, if necessary. (vi)
- Solve any two of the following: 1.

[8]

- (i) $\frac{d^2y}{dx^2} y = \frac{2}{1 + e^x}$ (use method of variation of parameters)
- (iii) $(2x+1)^2 \frac{d^2y}{dx^2} 2(2x+1) \frac{dy}{dx} 12y = 24x$.

P.T.O.

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

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

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)

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

$$f(0) = 0.$$

3.	(a)	The first four moments of a dis	stribution	about the value 4
		of the variable are -1.5 , 17 , -30	0 and 10	08. Find the central
		moments, β_1 and β_2 .		[4]
	(<i>b</i>)	By the method of least squares,	, find th	e straight line that
		best fits the following data:		[4]
		x	y	
		1	14	26
		2	27	

(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

3

4

5

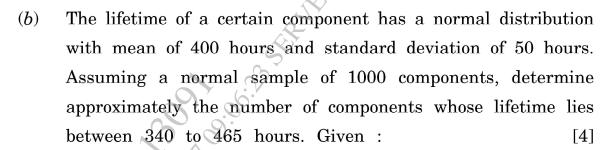
(ii) 2 defectives.

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]

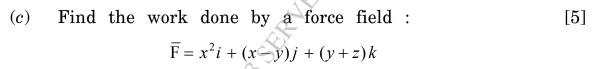
\boldsymbol{x}	y
10	18
14	12
18	24
22	6
22	30
30	36

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

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

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

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



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*)

(i)
$$\nabla \left(\frac{\overline{a}.\overline{r}}{r^3}\right) = \frac{\overline{a}}{r^3} - \frac{3(\overline{a}.\overline{r})\overline{r}}{r^5}$$

where \overline{a} is a constant vector.

- $\nabla^4(r^4) = 120.$
- Evaluate the integral (c) [5]

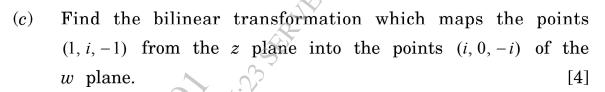
along the curve x = y = z = t from t = 0 to t = 2 where $\overline{F} = (x^2 + yz)i + (y^2 + zx)j + (z^2 + xy)k$

[4]**7.** If (a)

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

 $\oint \frac{z+4}{(z+1)(z+2)} dz$ circle |z| < 3. (*b*) Evaluate: [5]

where C is the circle |z| < 3.



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

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

$$\oint_C \frac{Az^2 + z}{z^2 - 1} dz$$

wehre C is the contour |z-1| =

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