Total No. of Questions-81

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Seat	
No.	

[4757]-1071

S.E. (Computer Engineering/Information Technology) (Second Semester) EXAMINATION, 2015 ENGINEERING MATHEMATICS-III (2012 PATTERN)

Time: Two Hours

Maximum Marks: 50

- N.B. :— (i) Attempt four questions : 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) Use of electronic non-programmble calculator is allowed.
 - (v) Assume suitable data if necessary.
- 1. (a) Solve (any two):
 - (i) $(D^2 + 9)y = x^3 \cos 3x$
 - (ii) $(D^2 + 2D + 1)y = e^{-x} \log x$
 - (iii) $(2x+1)^2 \frac{d^2y}{dx^2} 6(2x+1)\frac{dy}{dx} + 16y = 8(2x+1)^2$.
 - (b) Find Fourier sine transform of $f(x) = e^{-x} \cos x$, x > 0. [4]

Or

2. (a) A resistance of 50 ohms, an inductor of 2 henries and a 0.005 farad capacitor are connected in series with e.m.f. of 40 volts and an open switch. Find the instanteneous charge and current after the switch is closed at t = 0, assuming that at that time charge on capacitor is 4 coulomb. [4]

P.T.O.

- (b) Solve (any one): [4]
 - (i) Find z-transform of $f(k) = \frac{\sin ak}{k}$, k > 0.
 - (ii) Find inverse z-transform of $\frac{3z^2+2z}{z^2+3z+2}$, 1 < |z| < 2.
- (c) Solve difference equation : [4] f(k + 2) 3f(k + 1) + 2f(k) = 0, f(0) = 0, f(1) = 1.
- 3. (a) The first four monents of a distribution about the value 5 are 2, 20, 40 and 50. Obtain the first four central moments, mean, standard deviation and coefficient of skewness and kurtosis.
 [4]
 - (b) A manufacturer of electronic goods has 4% of his product defective. He sells the articles in packets of 300 and guarantees 90% good quality. Determine the probability that a particular packet will violate the guarantee.
 [4]
 - (c) Find the directional derivative of $xy^2 + yz^3$ at (2, -1, 1) along the line 2(x 2) = (y + 1) = (z 1). [4]

Or

4. (a) In an intelligence test administered to 1000 students the average score was 42 and standard deviation 24. Find the number of students with score lying between 30 and 54.

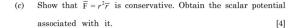
(Given: For
$$z = 0.5$$
, area = 0.1915). [4]

(b) Prove (any one): [4]

$$(i) \qquad \nabla^2 \left(\frac{\overline{a} \cdot \overline{b}}{r} \right) = 0$$

(ii)
$$\nabla \times \left(\frac{\overline{a} \times \overline{r}}{r}\right) = \frac{\overline{a}}{r} + \frac{(\overline{a} \cdot \overline{r})\overline{r}}{r^3}$$
.

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$$\int_{C} \overline{F} \cdot d\overline{r}$$

where $\overline{F} = (2x + y^2)\overline{i} + (3y - 4x)\overline{j}$ and

C is the parabolic arc $y = x^2$ joining (0, 0) and (1, 1).

(b) Using Stokes theorem, evaluate: [5]

$$\int_{\Omega} (x+y)dx + (2x-z)dy + (y+z)dz$$

where C is the curve given by $x^2 + y^2 + z^2 - 2ax - 2ay = 0$, x + y = 2a.

(c) Use divergence theorem to evaluate:

$$\iint\limits_{S} (x\overline{i} - 2y^2\overline{j} + z^2\overline{k}) . d\overline{s}$$

where s is the surface bounded by the region $x^2 + y^2 = 1$ and z = 0 and z = 1. [4]

6. (a) Apply Green's theorem to evaluate:

$$\int_{C} (2x^2 - y^2) dx + (x^2 + y^2) dy$$

where C is the boundary of the area enclosed by the x-axis and the upper-half of the circle $x^2 + y^2 = 16$. [4]

(b) Using Stokes theorem, evaluate

$$\iint_{S} (\nabla \times \overline{F}) \cdot d\overline{s}$$

where $\overline{F} = 3y\overline{i} - xz\overline{j} + yz^2\overline{k}$ and 's' is the surface of the paraboloid $2z = x^2 + y^2$ bounded by z = 2. [5]

$$\iiint\limits_{V} \frac{2}{r} dv = \iint\limits_{S} \frac{\overline{r} \cdot \hat{n}}{r} ds.$$

- 7. (a) Find the imaginary part of the analytic function whose real part is $x^3 - 3xy^2 + 3x^2 - 3y^2$. [4]
 - Evalaute : (b)

constant.

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

$$|z - 1| = 1.$$

[4]

Find the bilinear transformation, which maps the points (c) z = -1, 0, 1on to the points

$$w = 0, i, 3i$$
 respectively.

- Show that analytic function f(z) with constant amplitude is [4]
- Evaluate the following integral using residue theorem: (b)

$$\oint_C \frac{4-3z}{z(z-1)(z-2)} dz$$

where C is the circle:

$$|z| = \frac{3}{2}.$$
 [4]

Find the image of the straight line y = 3x under the transformation (c)

$$w = \frac{z - 1}{z + 1}.$$
 [5]

8. (a)