AS-301A

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 990301

Roll No. | | | | | | | | | | |

B. Tech.

(SEM. III) (ODD SEM.) THEORY EXAMINATION, 2014-15

ENGINEERING MATHEMATICS - III

Time : **3** Hours] [Total Marks : **100**

UNIT - 1

1 Answer any **four** from the followings : **4x5=20**

(1) Find analytic function $f(z) = u(r,\theta) + iv(r,\theta)$ such that $v(r,\theta) = r^2 \cos 2\theta - r\cos\theta + 2$.

(2) If $u = \dfrac{\sin 2x}{\cosh 2y + \cos 2x}$, find $f(z)$.

(3) Integrate $\dfrac{1}{(z^3 - 1)^2}$ in the counter clock-wise sense around the circle $|z-1| = 1$.

(4) Find Taylor's expansion of $f(z) = \dfrac{2z^3 + 1}{z^2 + z}$ about the point $z = 1$.

(5) Evaluate $\int_C \frac{dz}{z \sin z}$ where C is the unit circle about origin.

(6) Use contour integration to evaluate the real integral $\int_0^\infty \frac{dx}{(1+x^2)^3}$.

UNIT - 2

2 Answer any **four** from the followings : **4x5=20**

(1) Find Fourier cosine transform of $f(x) = e^{-2x} + 4e^{-3x}$.

(2) If $F(s)$ is the complex Fourier transform of $f(x)$, then prove that

$$F\{f(x)\cos x\} = \frac{1}{2}[F(s+a) + F(s-a)]$$

(3) Solve $\frac{\partial u}{\partial t} = k\frac{\partial^2 u}{\partial x^2}$ for $0 \le x < \infty, t > 0$ given the conditions

(i) $u(x,0) = 0$ for $x \ge 0$

(ii) $\frac{\partial u}{\partial x}(0,t) = -a$ (constant)

(iii) $u(x,t)$ is bounded

(4) Using Z-transform solve the difference equation

$$y_{k+3} - 3y_{k+2} + 3y_{k+1} - y_k = U(k),$$

$$y(0) = y(1) = y(2) = 0$$

(5) By using the formula of change of scale, find the Z-transform of $c^k \sin \alpha k, k \ge 0$.

(6) Using Residue Method, find

$$Z^{-1}\frac{3z^2 - 18z + 26}{(z-2)(z-3)(z-4)}$$

3 Answer any **four** from the followings : **4x5=20**

(1) The numbers of children in a family in a region areeither0, 1 or 2 with probability 0.2, 0.3, and 0.5 respectively. The probability of each child being a boy or a girl 0.5. Find the probability that a family has no boy.

(2) In a bold factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total. If their outputs 5, 4 and 2 per cent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured by machine B ?

(3) Show that in a Poisson distribution with unit mean, and the mean deviation about the mean is $\left(\frac{2}{e}\right)$ times the standard deviation.

(4) A manufacturer Knows that the condensers he makes contain on an average 1% of defectives. He packs them in boxes of 100. What is the probability that a box picked at random will contain 4 or more faulty condensers?

(5) Find the mean and standard deviation of Binomial distribution.

(6) The number of arrivals of customers during any day follows Poisson distribution with a mean of 5. What is the probability that the total number of customers on two days selected at random is less than 2 ?

4 Answer any **two** from the followings : **2x10=20**

(1) Show that the order of each subgroup of a finite group is a divisor of the orderof the group.

(2) Let G be an abelian group. Prove that the subset $S = \{p \in G : p = p^{-1}\}$ formsa subgroup of G.

(3) For any vectors u, v in an inner product space v, prove that $|\langle u, v\rangle| \le \|u\|\|v\|$.

5 Answer any **two** from the followings : **2x10=20**

(1) Compute the real root of $x \log_{10} x = 1.2$ correct to three decimal places using Newton's-Raphson Method.

(2) Using Runge-Kutta Method of fourth order, solve for y at $x = 1.2, 1.4$ from $\frac{dy}{dx} = \frac{2xy + e^x}{x^2 + xe^x}$ with $x_0 = 1, y_0 = 0$.

(3) From the given table compute the value of sin 38° using Newton's backward interpolation formula :

x	0	10	20	30	40
$\sin x$	0	0.17365	0.34202	0.50000	0.64279