ROLL NO. ___________________

**Code: AE56/AC56/AT56** **Subject: ENGINEERING MATHEMATICS - II**

## AMIETE – ET/CS/IT

**Time: 3 Hours** **JUNE 2013** **Max. Marks: 100**

***PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.***

**NOTE: There are 9 Questions in all.**

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

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**Q.1 Choose the correct or the best alternative in the following: (2×10)**

a. The invariant points of the bilinear transformation $w = \frac{az+b}{cz+d}$

**(A)** $az^2+(b-c)z-d=0$ **(B)** $az^2+(b+c)+d=0$
**(C)** $cz^2+(d-a)z-b=0$ **(D)** $cz^2+(d+a)z+b=0$

b. If $f(a) = \int_c \frac{2z^2 - z - 2}{z-a} dz$ where C is the circle $|z| = 2.5$, the value f(2) is

**(A)** 0 **(B)** $2\pi i$
**(C)** $4\pi i$ **(D)** $8\pi i$

c. Residue of $\frac{1-e^{2z}}{z^4}$ at its pole is

**(A)** $\frac{4}{3}$ **(B)** $-\frac{4}{3}$
**(C)** $\frac{3}{4}$ **(D)** $-\frac{3}{4}$

d. A unit vector normal to the surface $x^2y+2xz=4$ at the point (2,–2,3) is

**(A)** $\frac{1}{3}(-i+2j+2k)$ **(B)** $\frac{1}{3}(i-2j+2k)$
**(C)** $\frac{1}{3}(i-2j-2k)$ **(D)** $\frac{1}{3}(i+2j+2k)$

e. If $\vec{A}$ is a constant vector and $\vec{R} = xi + yj + zk$, then $\text{div}\left(\vec{A}\times\vec{R}\right)$ is

**(A)** $\vec{A}$ **(B)** $\vec{R}$
**(C)** $\vec{A}+\vec{R}$ **(D)** 0

f. If S is a closed surface enclosing a volume V and if $\vec{R}$ =xi+yj+zk, then $\iint_S \vec{R}.\hat{N}ds$ is

**(A)** V **(B)** 2V
**(C)** 3V **(D)** 4V

g. If $\Delta$ is forward difference operator and interval of differencing is one; $\Delta^3[(1-x)(1-2x)(1-3x)]$ is equal to

**(A)** –36 **(B)** –18
**(C)** –12 **(D)** –6

h. The solution of partial differential equation (y–z)p+(z–x)q=(x–y) is

**(A)** $x^2+y^2+z^2=f(xyz)$ **(B)** $x^2+y^2+z^2=f(x+y+z)$
**(C)** $x+y+z=f(xyz)$ **(D)** None of these

i. If the mean and variance of a binomial variance are 12 and 4 respectively, then the binomial distribution is

**(A)** $\left(\frac{1}{3}+\frac{2}{3}\right)^6$ **(B)** $\left(\frac{2}{3}+\frac{1}{3}\right)^{12}$
**(C)** $\left(\frac{1}{3}+\frac{2}{3}\right)^{18}$ **(D)** $\left(\frac{1}{3}+\frac{2}{3}\right)^{24}$

j. ‘A’ speaks the truth in 75% cases and ‘B’ in 80% of the cases. The percentage of cases in which they are likely to contradict each other in stating the same fact is

**(A)** 45% **(B)** 35%
**(C)** 30% **(D)** 25%

**Answer any FIVE Questions out of EIGHT Questions.**
**Each question carries 16 marks.**

**Q.2** a. Show that every analytic function f(z)=u(x,y)+iv(x,y) defines two families of curves $u(x,y)=C_1$ and $v(x,y)=C_2$ which form an orthogonal system. **(8)**

b. Find the bilinear transformation which maps the points 1, i, –1 into the points 0, 1, ∞. **(8)**

**Q.3** a. State and prove Cauchy’s integral formula. **(2+6)**

b. Find the Laurent's series expansion of $\frac{Z^2-6Z-1}{(Z-1)(Z-3)(Z+2)}$ in the region $3<|Z+2|<5$ **(8)**

**Q.4** a. Find the angle between the surfaces $x^2+y^2+z^2=9$ and $Z=x^2+y^2-3$ at the point (2, –1,2) **(8)**

b. Show $\operatorname{div}(\vec{A}\times\vec{B})=\vec{B}\cdot\operatorname{curl}\vec{A}-\vec{A}\cdot\operatorname{curl}\vec{B}$ **(8)**

**Q.5** a. Apply Green's theorem to evaluate $\int[(y-\sin x)dx+\cos x\,dy]$ where C is the plane triangle enclosed by the lines y=0, $y=\frac{2}{\Pi}x$ and $x=\frac{\Pi}{2}$. **(8)**

b. For any closed surface S, use Divergence theorem to evaluate $\int_S[x(y-z)i+y(z-x)j+z(x-y)k].ds$ **(8)**

**Q.6** a. Find an approximate value of $\log_e 5$ by calculating to 4 decimal places by Simpson's $\frac{1}{3^{rd}}$ rule. $\int_0^5\frac{dx}{4x+5}$ dividing the range into ten equal parts. **(8)**

b. Given the values **(8)**

| | | | | | |
|---|---|---|---|---|---|
| X | 5 | 7 | 11 | 13 | 17 |
| f(x) | 150 | 392 | 1452 | 2366 | 5202 |

Evaluate f(9), using
(i) Lagrange's formula (ii)Newton's divided difference formula

**Q.7** a. Use Charpit's method to solve pxy +pq +qy = yz **(8)**

b. Use method of separation of variables to solve $3\frac{\partial U}{\partial x}+2\frac{\partial U}{\partial y}=0$, given that $U(x,0)=4e^{-x}$ **(8)**

**Q.8** a. Two persons 'A' and 'B' toss an unbiased coin alternately on the understanding that the first who gets the head wins. If 'A' starts the game, compare their chances of winning. **(8)**

b. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of accident is 0.01, 0.03 and 0.15 respectively. One of the insured person meets an accident. What is the probability that he is a scooter driver? **(8)**

**Q.9** a. The diameter of an electric cable is assumed to be a continuous variate w[...] probability density function given by $f(x) = Kx(1-x),\ 0 \le x \le 1$. Find the number[...] K. Also find the mean and the variance. **(2+3+3)**

b. Find the mean and variance of a Binomial Distribution. **(4+4)**