ROLL NO. ___________________

Code: AE56/AC56/AT56 Subject: ENGINEERING MATHEMATICS – II
AE107/AC107/AT107

AMIETE – ET/CS/IT (Current & New Scheme)

Time: 3 Hours **JUNE 2015** **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.**

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

a. The invariant points of the transformation w = $\frac{5z+4}{z+5}$ are

(A) (2, 2) **(B)** (-2, -2)
(C) (2, -2) **(D)** None of these

b. The value of the integral $\int_C \frac{1+2z}{z(1+z)}dz$, where C is $|z| = \frac{1}{2}$, is

(A) πi **(B)** $2\pi i$
(C) $3\pi i$ **(D)** 0

c. The residue of $\frac{ze^z}{(z-1)^3}$ at its pole is

(A) 0 **(B)** $\frac{e}{2}$
(C) e **(D)** $\frac{3e}{2}$

d. If $\vec{A}$ is a constant vector and $\vec{R}$ = xi + yj + zk, then grad ($\vec{A}.\vec{R}$) is equal to

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

e. If R = xi + yj + zk, then $\int_s \vec{R}.d\vec{s}$, s being the surface of unit sphere is

(A) π **(B)** 2π
(C) 4π **(D)** 8π

f. The missing term in the following table is:

x:	0	1	2	3	4
f(x):	1	3	9	-	81

(A) 33 **(B)** 31
(C) 30 **(D)** 27

g. The solution of $p\sqrt{x}+q\sqrt{y}=\sqrt{z}$ is

(A) $\sqrt{x}\sqrt{y}=f\left(\sqrt{y}\sqrt{z}\right)$ **(B)** $\sqrt{z}+\sqrt{y}=f\left(\sqrt{y}+\sqrt{x}\right)$
(C) $\sqrt{z}+\sqrt{x}=f\left(\sqrt{x}+\sqrt{y}\right)$ **(D)** $\sqrt{z}-\sqrt{x}=f\left(\sqrt{x}-\sqrt{y}\right)$

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

(A) 20% **(B)** 25%
(C) 35% **(D)** 40%

i. If f(x) = $\begin{cases} kxe^{-x}, & x>0 \\ 0, & \text{elsewhere} \end{cases}$, is the p.d.f. of x, then k is

(A) 1 **(B)** 2
(C) 4 **(D)** $\frac{1}{2}$

j. If a random variable has a Poisson distribution such that P(1) = P(2), then mean of the distribution is

(A) 1 **(B)** 2
(C) 3 **(D)** 4

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

Q.2 a. Show that every analytic function w = f(z) define two families of curves, which from an orthogonal system. **(8)**

b. Show that the transformation $\omega=\sin z$, maps the families of lines x = constant and y = constant into two families of confocal central conics. **(8)**

Q.3 a. If f(α) = $\oint_C \frac{3z^2+7z+1}{z-\alpha}dz$, where C is the circle $x^2+y^2=4$, find the values of (i) F' (1-i) (ii) F''(1-i) **(8)**

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

Q.4 a. Show that Curl Curl $\vec{F}$ = grad div $\vec{F}$ - $\nabla^2\vec{F}$. **(8)**

b. Find the values of λ and μ so that the surface $\lambda x^2 y + \mu z^3 = 4$, may cut the surface $5x^2 = 2yz + 9x$ orthogonally at (1, -1, 2). **(8)**

Q.5 a. If $\vec{F} = (5xy - 6x^2)\, i + (2y - 4x)\, j$, evaluate $\int_C \vec{F}.d\vec{R}$ along the curve C in the xy – plane, $y = x^3$ from the point (1, 1) to (2, 8). **(8)**

b. Use Divergence theorem to evaluate $\iint_S \vec{F}\cdot\overrightarrow{dS}$, where $\vec{F} = x^3 i + y^3 j + z^3 k$, and S is the surface of the sphere $x^2 + y^2 + z^2 = a^2$ **(8)**

Q.6 a. Estimate the values of $f(22)$ and $f(42)$ from the following available data: **(8)**

x:	20	25	30	35	40	45
f(x):	354	332	291	260	231	204

b. Find an approximate value of $\log_e 5$ by calculating to 4 decimal places, by Simpson's $\frac{1}{3}$ rule, $\int_0^5 \frac{dx}{4x+5}$, by dividing the range into 10 equal parts. **(8)**

Q.7 a. Solve the equation $\frac{y-z}{yz}p + \frac{z-x}{zx}q = \frac{x-y}{xy}$ **(8)**

b. Use Charpit's method to solve:
$2zx - px^2 - 2qxy + pq = 0$ **(8)**

Q.8 a. A student takes his examination in four subjects A, B, C, D. His chances of passing in A are $\frac{4}{5}$, in B $\frac{3}{4}$, in C $\frac{5}{6}$ and in D are $\frac{2}{3}$. To qualify, he must pass in A and at least two other subjects. What is the probability that he qualifies. **(8)**

b. A ball is transferred from an urn containing two white and three black balls to another urn containing four white and five black balls. A white ball is then taken out from second urn. What is the probability that the transferred ball is white? **(8)**

Q.9 a. The diameter of an electric cable is assumed to be a continuous variable with p.d.f, f(x) = k x (1-x), $0 \le x \le 1$. Find the value of k and also find mean and variance of x. **(8)**

b. A Car- hire firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson distribution with mean 1.5, calculate the proportion of days
(i) on which there is no demand
(ii) on which demand is refused ($e^{-1.5} = 0.2231$) **(8)**