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

ROLL NO. _____

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

Time: 3 Hours **DECEMBER 2018** **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. If $f(z)$ is analytic function and $f'(z)$ is continuous at each point with in and on a simple closed curve C, then $\oint_C f(z)\,dz$ is

(A) $2\pi i$ **(B)** 0

(C) πi **(D)** $-\pi i$

b. The residue at the poles of the function $f(z) = \cot z$ is equal to

(A) 0 **(B)** -1

(C) 1 **(D)** None of these

c. If $f(z)$ is entire function, then

(A) $f(z)$ is analytic for all z **(B)** $f(z)$ has finite singular points.

(C) $f(z)$ diverges for all z **(D)** None of these

d. If $\vec{r} = xi + yj + zk$, then the value of curl $\vec{r}$ is

(A) 3 **(B)** 1

(C) 0 **(D)** None of these.

e. The magnitude of the gradient of the function $f = xyz^3$ at $(1, 0, 2)$ is

(A) 2 **(B)** 8

(C) 4 **(D)** None of these

f. The value of $\Delta^3 y_0$ is

(A) $y_3 + y_2 - 3y_1 - y_0$ **(B)** $y_3 - 3y_2 + 3y_1 + y_0$

(C) $y_3 - 3y_2 + 3y_1 - y_0$ **(D)** $y_3 + 3y_2 + 3y_1 + y_0$

g. The missing term in the following table is

x:	2	3	4	5	6
f(x):	45.0	49.2	54.1	.....	67.4

(A) 60.05 **(B)** 59.64

(C) 64.02 **(D)** None of these

h. The solution of $yzp - xzq = xy$ is

(A) $f(x^2 + y^2,\ x^2 + z^2) = 0$ **(B)** $f(x^2 + y^2,\ x^2 - z^2) = 0$

(C) $f\left(\frac{x}{y},\ \frac{y}{z}\right) = 0$ **(D)** None of these

i. An urn contains 10 black and 10 white ball. The probability of drawing two balls of same colour is

(A) $^9/_{19}$ **(B)** $^8/_{20}$

(C) $^9/_{20}$ **(D)** None of these

j. The standard deviation of a Poisson distribution is

(A) m **(B)** $\sqrt{m}$

(C) 1 **(D)** None of these

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

Q.2 a.

Show that the function defined by $f(z) = \sqrt{|xy|}$ is not analytic at the origin, although Cauchy-Riemann equation is satisfied there. **(8)**

b. Show that the function $u = \frac{1}{2}\log(x^2 + y^2)$ is harmonic. Find its harmonic conjugate. **(8)**

Q.3 a. Evaluate $\oint_c \frac{sin^2 z}{(z-\frac{\pi}{6})^2}$ dz, where c is the circle $|z|$=1 **(8)**

b. Find the residues of the function $f(z) = \frac{z^3}{(z-1)^4\,(z-2)(z-3)}$ at its poles. Hence evaluate $\oint_c cf(z)dz$ where c is the circle, $|z| = 2.5$. **(8)**

Q. 4. a. Prove that curl of vector point function is a vector and hence give the physical interpretation of curl. **(8)**

b. Show that $\nabla(\vec{A}.\vec{B}) = (\vec{A}.\vec{\nabla})\vec{B} + (\vec{B}.\vec{\nabla})\vec{A} + \vec{A} \times (\vec{\nabla} \times \vec{B}) + \vec{B} \times (\vec{\nabla} \times \vec{A})$. (8)

Q. 5. a. Using Green's theorem, evaluate $\int_C (x^2ydx + x^2dy)$, where C is the boundary described counter clockwise of the triangle with vertices $(0,0), (1,0), (1,1)$. **(8)**

b. Evaluate $\int_C \vec{F}.d\vec{r}$, where $\vec{F} = (x - 3y)i + (y - 2x)j$ and C is closed curve in the xy-plane given by $x = 2\cos t$, $y = 3\sin t$ from $t = 0$ to $t = 2\pi$. **(8)**

Q. 6. **a.** From the following table

x:	1	2	3	4	5	6	7	8
f(x):	1	8	27	64	125	216	343	512

Estimate $f(7.5)$. **(8)**

b. Evaluate the integral $\int_0^1 \frac{x^2}{1+x^3}dx$ by using Simpson's $1/3^{rd}$ rule. Compare the result with the exact value. **(8)**

Q. 7. a. Solve the equation $yp = 2yx + log\ q$. **(8)**

b. Solve the equation $(mz - ny)p + (nx - lz)q = ly - mx$. **(8)**

Q. 8. a. From a bag containing 5 white, 7 red and 4 black balls a man draws 3 balls at random, find the probability of being all white. **(8)**

b. A problem in mechanics is given to three students A, B and C whose chances of solving it are $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved ? **(8)**

Q. 9. a. If mean and variance of a binomial distribution are 4 and 2 respectively, find the probability of (i) exactly 2 success (ii) less than 2 success (iii) at least 2 success. **(8)**

b. The probability that a pen manufactured by a company will be defective is $\frac{1}{10}$. If 12 such pens are manufactured, find the probability that
(i) exactly two will be defective.
(ii) at least two will be defective.
(iii) none will be defective **(8)**