15/12/18
1.30 - 4.30

H Roll No. .....

TMA–301(A)

B. TECH. (ME) (THIRD SEMESTER) END SEMESTER EXAMINATION, 2018

ENGINEERING MATHEMATICS

Time : Three Hours

Maximum Marks : 100

Note : (i) This question paper contains five questions with alternative choice.

(ii) All questions are compulsory.

(iii) Each part carries **ten** marks. Total marks assigned to each question are **twenty.**

1. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

   (a) Determine the analytic function whose imaginary part is :

   $$v = \log\left(x^2 + y^2\right) + x - 2y.$$

   (b) Show that the function defined by :

   $$f(z) = \begin{cases} \dfrac{x^3y^5(x+iy)}{x^6+y^{10}}, & z \neq 0 \\ 0, & z = 0 \end{cases}$$

   satisfy Cauchy-Riemann equation at the origin but is not analytic at that point.

(c) Show that $u = \frac{1}{2}\log\left(x^2 + y^2\right)$ is a harmonic function. Find its harmonic conjugate.

2. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Find the value of the integral $\int_0^{1+i}\left(x^2 - iy\right)dx$.

(i) Along the straight line from $y = x$.

(ii) Along the parabola $y = x^2$.

(b) Use Cauchy integral formula to evaluate $\int_C \frac{z}{z^2 - 3z + 2}dz$, where C is the circle $|z - 2| = 1/2$.

(c) Evaluate $\int_C \frac{e^z}{(z-1)(z-4)}dz$, where C is circle $|z| = 2$, by using Cauchy integral formula.

3. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Evaluate the value of $\log_e 2$ by finding $\int_0^1 \frac{2x}{1 + x^2}dx$, using Simpson's 1/3 rule by dividing the interval into four equal parts.

(b) Construct Newton's forward interpolation polynomial for the following data :

x	y
4	1
6	3
8	8
10	16

and evaluated y for $x = 5$.

(c) Evaluate $\int_0^{1/2} \frac{dx}{\sqrt{1 - x^2}}$, by using Weddle's rule, taking $n = 6$.

4. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Solve $\frac{dy}{dx} = 1 - 2xy$, by Picard's method, given $y = 0$ at $x = 0$.

(b) Use Taylor's series method to solve the equation $\frac{dy}{dx} = -xy,\ y(0) = 1$.

(c) Use Runge-Kutta method to approximate y, when $x = 0.1$ and $x = 0.2$, given that $\frac{dy}{dx} = x + y, y = 1$ when $x = 0$.

5. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Calculate Karl Pearson's coefficient of skewness for the following data :

Marks	No. of Students
0—10	10
10—20	12
20—30	18
30—40	25
40—50	16
50—60	14
60—70	8

(b) Calculate the first four moments of the following distribution about the mean and hence find β_1 and β_2 :

x	f
0	1
1	8
2	28
3	56
4	70
5	56
6	28
7	8
8	1

(c) Probability that a man aged 60 will be live to be 70 is 0.65. What is the probability that out of 10 men, now 60 at least 7 will live to be 70 ?

F. No. : c-50