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TMA–302

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

ENGINEERING MATHEMATICS—III

Time : Three Hours

Maximum Marks : 100

Note : (i) This question paper contains five questions and each question carries equal marks.

(ii) All questions are compulsory.

(iii) Each question has three Parts (a), (b) and (c). Attempt any *two* Parts of each question.

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

(a) Define an analytic function and determine the analytic function whose real part is :

$$u = e^{-x}(x \sin y - y \sin 2y).$$

(b) Show that the function defined by $f(z)=\sqrt{|xy|}$ satisfies Cauchy-Riemann equation at the origin but is not analytic at that point.

(c) Define a Harmonic function. Show that $e^x(x\cos y - y\sin y)$ is a harmonic function and also find its harmonic conjugate function.

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

(a) Find the Fourier transform of :

$$f(x)=\begin{cases}1-x^2, & \text{if } |x|<a\\ 0, & \text{if } |x|>1\end{cases}$$

(b) Find the inverse Fourier sine transform of :

$$\frac{1}{s}e^{-as}.$$

(c) Find the Fourier cosine transform of :

$$f(x)=\frac{e^{-ax}}{x}.$$

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

(a) Perform five iterations of the bisection method to obtain the smallest positive root of the equation :

$$f(x)=x^3-5x+1.$$

(b) Evaluate :

$$\int_1^2 \frac{1}{1+x^2}\,dx,$$

taking $h = 0.2$, using Trapezoidal rule.

(c) Find the smallest positive root of the function :

$$f(x)=x^3-5x+3$$

by using Newton-Raphson method.

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

(a) Calculate the first four moments about the mean for the following data. Also calculate β_1 and β_2 :

x	f
1	1
2	6
3	13
4	25
5	30
6	22
7	9
8	5
9	2

(b) A die is thrown 8 times and it is required to find the probability that 3 will show :

(i) Exactly two times

(ii) At least seven times

(iii) At least once.

(c) Find the moment generating function of the exponential distribution :

$$f(x)=\frac{1}{c}e^{x/c},\ 0\le x\le\infty,\ c>0.$$

Hence, find its mean and standard deviation.

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

(a) Find the best value of a and b so that $y=a+bx$ fits the data given in the table :

x	y
0	1.0
1	2.9
2	4.8
3	6.7
4	8.6

(b) Calculate the correlation coefficient between x and y for the following data :

x	y
21	60
23	71
30	72
54	83
57	110
58	84
72	100
78	92
87	113
90	135

(c) Calculate Karl Pearson's coefficient of correlation for the data given below :

x	y
3	7
7	12
5	8
4	8
6	10
8	13
2	5
7	10