



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/M.TECH (ECE-OLD)/SEM-1/MCE-101/2011-12**

**2011**

**ADVANCED ENGINEERING MATHEMATICS AND  
STATISTICS**

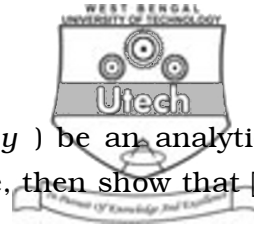
Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

Answer Q. No. 1 and any *four* questions from the rest.

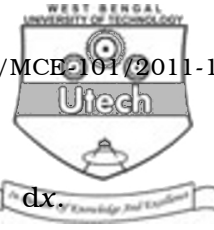
1. Answer the following questions : 7 × 2 = 14
- a) Define universal set and a complement of a given set with examples.
  - b) How does the difference equation,  
$$u_{x+2} - (a + b)u_{x+1} + ab u_x = 0,$$
arise from the relation  $U_x = Aa^x + Bb^x$ , A and B being two arbitrary constants ?
  - c) Describe singular point of a complex function and the concept of its poles.



- d) If  $w = f(z) = u(x, y) + iv(x, y)$  be an analytic function in some region of the  $z$ -plane, then show that  $\nabla^2 u = \nabla^2 v = 0$ .
- e) Write down the form in which Newton's formula for forward interpolation is usually written for a function  $y = \phi(x)$ .
- f) Describe the classical definition of probability and discuss its limitation.
- g) Explain the measure of central tendency of frequency distribution.
2. a) If a finite set has  $n$  elements, then prove that it has  $2^n$  subsets.
- b) Prove that  $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ .
- 6 + 8
3. a) Determine the analytic function whose real part is  $x^3 - 3xy^2 + 3x^2 - 3y^2 + 2x + 1$ .
- b) Show that  $\int_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz = 4(\pi + 1)i$ , where  $c$  is the circle,  $|z| = 3$ .
- 7 + 7
4. a) Find Newton's formula for forward interpolation in terms of  $x$ .
- b) From the table given below, calculate  $\phi(1.2)$  correct to two decimal places.

<b>X :</b>	0	1	2	3	4
<b><math>\phi(x)</math> :</b>	1.00	1.50	2.20	3.10	4.60

8 + 6



5. a) Find the extremal of the function  $\int_{x_0}^{x_1} \frac{y^2}{x^3} dx$ .
- b) Discuss Lagrange's multiple method to solve constrained problems of optimization. 6 + 8

6. a) The sum of two non-negative quantities is equal to  $2n$ . Find the probability that their product is not less than  $\frac{3}{4}$  times their greatest product.
- b) Find the mean age from the following distribution :

<b>Age in years :</b>	15-19	20-24	25-29	30-34	35-39	40-44
<b>No. of persons :</b>	37	81	43	24	9	6

7 + 7

7. a) Define residue of a function  $f(z)$  at its singularity  $z_0$ . Assuming Laurent's expansion of  $f(z)$  in the neighbourhood of  $z_0$ , find its residue at  $z_0$ .
- b) Determine the poles and residues of the function :

$$F(z) = \frac{1}{z^4 + 2z^2 + 1} . \quad 7 + 7$$

