Birla Institute of Technology & Science, Pilani

First Semester 2017-2018, BITS F113 (General Mathematics I)
Mid Semester Examination (Closed Book)

Time: 90 Min.   **Date: October 12, 2017 (Thursday)**   **Max. Marks: 35**

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1. Write solution of each question on fresh page. Answer subparts of each question in continuation.

2. Write **END** in the answer sheet just after the final attempted solution.

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1. (a) If $A = [1, 5)$ and $B = (4, 7]$, find $(A \cap B)'$ and $(A \cup B)'$. **[2]**

   (b) Let $f(x) = \begin{cases} \frac{x|x-2|}{x-2}, & x \neq 2 \\ -1, & x = 2 \end{cases}$.

   Draw graph of f. Find its domain and range. Also find whether it is one-one and onto. **[5]**

2. (a) Find the general solution of $2\cos^2 x + 3\sin x = 0$. **[3]**

   (b) Find the values of θ for which the real and imaginary parts of the following complex number are equal: **[4]**

   $$\frac{3 + 2i\sin\theta}{1 - 2i\sin\theta}.$$

3. (a) Find the number of different 8-letter arrangements that can be made from the letters of the word DAUGHTER so that
   (i) all vowels are together
   (ii) all vowels do not occur together. **[4]**

   (b) For what value of a the 17th and 18th terms of the expansion of $(1 + a)^{50}$ are equal. **[3]**

4. (a) How many terms of the G.P. 3, 3^2, 3^3, ... are needed to give the sum 120? **[3]**

   (b) Find the value of k for which the lines $2x + y - 3 = 0$, $5x + ky - 3 = 0$ and $3x - y - 2 = 0$ are concurrent. Also, find the value of k so that the lines $2x + y - 3 = 0$ and $5x + ky - 3 = 0$ are perpendicular. **[4]**

5. (a) Find the distance between the lines $3x - 4y + 3 = 0$ and $8y - 6x + 1 = 0$. **[2]**

   (b) Draw a rough sketch of the conic section $16x^2 + y^2 = 16$ labelling the coordinates of foci and vertices. Also find the eccentricity and the length of the latus rectum. **[5]**

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