

**B.Tech. MECHANICAL ENGINEERING  
(COMPUTER INTEGRATED  
MANUFACTURING)**

**Term-End Examination**

**June, 2016**

00970

**BME-015 : ENGINEERING MATHEMATICS – II**

*Time : 3 hours*

*Maximum Marks : 70*

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*Note : Attempt any seven questions. All the questions carry equal marks. Use of calculator is permitted.*

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1. Discuss the convergence or divergence of the series

$$\sum_{n=1}^{\infty} \sqrt{n^4 + 1} - \sqrt{n^4 - 1}. \quad 10$$

2. Test the convergence and absolute convergence of the following series : 10

$$\frac{1}{1 \cdot 2} - \frac{1}{3 \cdot 4} + \frac{1}{5 \cdot 6} - \frac{1}{7 \cdot 8}$$

3. Show that

$$\log(1-x) = -x - \frac{x^2}{2} - \frac{x^3}{3} - \dots$$

$$-1 \leq x < 1$$

and deduce that

$$\log 2 = 1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \dots \quad 10$$

4. Find the Fourier half-range cosine series for the function

$$f(x) = x \text{ for } 0 < x < \pi. \quad 10$$

5. If  $(\cos \theta + i \sin \theta)(\cos 2\theta + i \sin 2\theta) + \dots + \dots$   
 $(\cos n\theta + i \sin n\theta) = 1,$

prove that  $\theta = \frac{4k\pi}{n(n+1)}$ , where  $k$  is any integer.  $10$

6. Evaluate  $\int_{1-i}^{2+i} (2x + 2iy + 3) dz$  along the path

$$x = t + 1, \quad y = 2t^2 - 1. \quad 10$$

7. Find the Laurent's expansion of the function

$$f(z) = \frac{7z - 2}{(z+1)z(z-2)} \text{ in the annulus } |z+1| > 3. \quad 10$$

8. Show that

$$I_1 = \int_0^{2\pi} \cos^{2n} \theta \, d\theta = \int_0^{2\pi} \sin^{2n} \theta \, d\theta = \frac{2\pi(2n)!}{2^{2n}(n!)^2}. \quad 10$$

9. Find the general solution of

$$(y^2 + 1) \, dx + (2xy + 1) \, dy = 0. \quad 10$$

10. Find the orthogonal trajectories of the one-parameter family of curves  $e^x + e^{-y} = c$ . 10

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