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BME-015

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

00563

December, 2018

BME-015 : ENGINEERING MATHEMATICS – II

Time : 3 hours *Maximum Marks : 70*

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

1. (a) Define conditionally convergent series. *2*

(b) Show that the series

$$\sum \frac{(-1)^{n-1}}{n^p}$$

converges conditionally for $0 < p \leq 1$. *8*

2. Discuss the convergence of the series $\sum x_n$, where

$$x_n = \frac{\sqrt{n-1}}{\sqrt{n^3+1}} x^n, \; x > 0.$$ *10*

3. Find the Fourier series to represent f(x), where

$f(x) = (2x - 1)$ for $0 < x < 1$. *10*

4. Find two linearly independent solutions of the differential equation

$$x\frac{d^2y}{dx^2} + \frac{dy}{dx} + xy = 0, \quad x > 0.$$ *10*

5. Obtain the general and complete integral of the partial differential equation

$$yz\frac{\partial z}{\partial x} + zx\frac{\partial z}{\partial y} = xy.$$ *10*

6. Solve

$$x\frac{dy}{dx} + y = x^3y^3 \sin x \text{ for } x, y > 0.$$ *10*

7. Show that the function

$$u = 2x - 3x^3 + 9xy^2$$

is harmonic. Find its conjugate function v. Determine the function $w(z) = u + iv$ in terms of z. *10*

8. Integrate $f(z) = z^2$ from A (2, 3) to B (4, 9) along the curve $C : x = t, y = t^2$. *10*

9. Show that the image of $|z - 2i| = 1$ under the mapping $w = \frac{1}{z}$ is the circle $|3w + 2i|^2 = 1$. *10*

10. Using Residue theorem, evaluate

$$\oint_C \frac{e^z}{\cos \pi z} dz,$$

where C is the unit circle $|z| = 1$. *10*
