00897

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

June, 2013

BME-015 : ENGINEERING MATHEMATICS-II

Time : 3 hours *Maximum Marks : 70*

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

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1. Discuss the convergence or divergence of the series **7**

$$\sum_{n=1}^{\infty}\left\{\sqrt{n^4+1}-\sqrt{n^4-1}\right\}$$

2. Test the convergence of the series **7**

$$\frac{1}{1.\ 2.\ 3}+\frac{3}{2.\ 3.\ 4}+\frac{5}{3.\ 4.\ 5}+\ldots\ldots\ldots\ldots$$

3. Obtain Fourier's series for the expansion of $f(x)=x.\sin x$ in the interval $-\pi < x < \pi$. **7**

4. Find the Fourier half-range cosine series of the function **7**

$$f(t)=\begin{cases}2t, & 0<t<1\\ 2(2-t), & 1<t<2\end{cases}$$

5. Solve the differential equation : 7

$$\cos(x+y)dx = dy$$

6. Solve the differential equation : 7

$$\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = x\cos x$$

7. Solve by the method of variation of parameters 7

$$\frac{d^2y}{dx^2} + n^2y = \sec nx$$

8. Solve : 7

$$\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial y^2} - 3\frac{\partial^2 z}{\partial x \partial y} = e^{2x-y} + e^{x+y} + \cos(x+2y)$$

9. Use the method of separation of variable to solve 7

$\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$, where $u(x, 0) = 6e^{-3x}$.

10. Express $(2+3i)(3-2i)$ in the form of $(a+ib)$. Also find their modulus and arguments. 7

11. Determine the analytic function whose real part is $e^{2x}(x\cos 2y - y\sin 2y)$. 7

12. Evaluate the following integral by using Cauchy-Integral formula 7

$$\int_C \frac{z-1}{(z+1)^2 (z-2)} dz$$

where C is $|z-i| = 2$.

13. Determine the poles of the function $f(z) = \frac{z^2}{(z-1)^2 (z+2)}$ and the residue at each pole. Hence evaluate $\int_C \frac{z^2}{(z-1)^2 (z+2)} dz$, where $C = |z| = 3$. 7

14. Expand $\frac{1}{z^2 - 3z + 2}$ in the region 7

(a) $|z| < 1$;

(b) $1 < |z| < 2$;

(c) $|z| > 2$.

15. Find a bilinear transformation which map the points i, $-i$, 1 of the z-plane into 0, 1, ∞ of the w-plane respectively. 7