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BME-015

01223

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

December, 2012

BME-015 : ENGINEERING MATHEMATICS-II

Time : 3 hours *Maximum Marks : 70*

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

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1. Show that the sequence $<x_n>$, where $x_n = (n)^{1/n}$, $\forall$ n ϵ N converges to 1. 7

2. Test the convergence of the following series : 7

$$\frac{1.2}{3^2.4^2} + \frac{3.4}{5^2.6^2} + \frac{5.6}{7^2.8^2} + ...$$

3. Find the fourier series expansion for the function $f(x) = x\cos x, -\pi < x < \pi$. 7

4. Obtain the half-range sine series for the function $f(x) = x^2$ in the interval $0 < x < 3$. 7

5. Solve the differential equation : 7

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

6. Find the complete solution of the differential equation given by : 7

$$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = xe^{3x} + \sin 2x$$

7. Solve by the method of variation of parameters 7

$$\frac{d^2y}{dx^2} + 4y = \tan 2x$$

8. Solve in series the Legendre's equation of order one : 7

$$\left(1-x^2\right)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = 0$$

9. Solve : $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin x$ 7

10. Find the modulus and principal argument of 7

$$\frac{(1+i)^2}{1-i}.$$

11. Determine the analytic function $f(z) = u + iv$, if : $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 2x + 1$. 7

12. Find the value of $\int_C \frac{2z^2 + z}{z^2 - 1} dz$, where C is the circle of unit radius with centre at $z = 1$. 7

13. Find the Taylor's and Laurent's series, which represent the function : 7

$$\frac{z^2 - 1}{(z+2)(z+3)} \text{ in}$$

(a) $|z| < 2$; (b) $2 < |z| < 3$

14. Find the bilinear transformation which maps the point $z = 1, i, -1$ into the points $w = i, 0, -i$. 7

15. Determine poles and residue at each point of the function : 7

$$f(z) = \frac{z^2}{(z+1)^2 (z-2)}$$
