Reg. No. | | | | | | | | | | | | |

Question Paper Code : 27278

5 Year M.Sc. DEGREE EXAMINATION, MAY/JUNE 2016

First Semester

Software Engineering

EMA 001 – TRIGONOMETRY, ALGEBRA AND CALCULUS

(Common to : 5 year M.Sc. Software Systems)

(Regulations 2010)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Explain cos 4θ in a series f powers of cosθ.

2. Show hat log (cosθ + i sin θ) = iθ.

3. Define rank of the matrix.

4. Find the nature of the quadratic form $x^2 + y^2 + z^2$.

5. Find the Taylor Series expansion of xy about the point (1, 1) upto the first degree terms.

6. If $u - \sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$.

7. Evaluate $\int_0^{\pi/2} \sin^9 \theta d\theta$.

8. Find the area enclosed by the x-axis, the curve $y = 4 + \cos x$ and the ordinates $x = 0$ and $x = 2\pi$.

9. Solve $(4D^2 - 4D + 1)\, y = 0$.

10. Transform the equation $(2x + 3)^2 y'' - 2(2x + 3)y' + 2y = 6x$ into a linear equation with constant coefficients.

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Prove that $\frac{\sin 7\theta}{\sin\theta} = 7 - 56 \sin^2\theta + 112 \sin^4\theta - 64 \sin^6\theta$. **(8)**

(ii) Separate the real and imaginary parts of $\tan(x + iy)$. **(8)**

OR

(b) (i) Expand $\cos^7\theta$ in a series of cosines of multiples of θ. **(6)**

(ii) If $x + iy = C \cos(A - iB)$. Prove that

(1) $\frac{x^2}{C^2 \cos h^2 B} + \frac{y^2}{C^2 \cos h^2 B} = 1$. And

(2) $\frac{x^2}{C^2 \cos^2 A} + \frac{y^2}{C^2 \sin^2 A} = 1$. **(10)**

12. (a) (i) Test for the consistency of the following system of equations and solve them, if consistent :

$3x + y + z = 8;\ -x + y - 2z = -5$

$x + y + z = 6$ and $-2x + 2y - 3z = -7$. **(8)**

(ii) Find A^n, using Cayley-Hamilton theorem, when $A = \begin{bmatrix} 5 & 3 \\ 1 & 3 \end{bmatrix}$. **(8)**

OR

(b) Diagonalise the matrix $\begin{bmatrix} 3 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 3 \end{bmatrix}$. **(16)**

13. (a) (i) If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, prove that : **(8)**

(1) $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = \frac{3}{x+y+z}$.

(2) $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u = \frac{-9}{(x+y+z)^2}$.

(ii) Expand $xy^2 + 2x - 3y$ in powers of $(x + 2)$ and $(y - 1)$ upto the third degree terms. **(8)**

OR

(b) (i) If z be a function of x and y, $x = e^u + e^{-v}$, $y = e^{-u} - e^v$, prove that

$\frac{\partial z}{\partial u} - \frac{\partial z}{\partial v} = x\frac{\partial z}{\partial x} - y\frac{\partial z}{\partial y}$. **(8)**

(ii) Test the following function or maximum and minimum

$f(x, y) = x^2 + xy + y^2 + \frac{1}{x} + \frac{1}{y}$. **(8)**

14. (a) Find the volume bounded by the cylinder $x^2 + y^2 = 4$ and the planes $y + z = 4$ and $z = 0$. **(16)**

OR

(b) Change the order of integration in $\int_0^a \int_{a-\sqrt{a^2-y^2}}^{a+\sqrt{a^2-y^2}} xy\, dx\, dy$ and then evaluate it. **(16)**

15. (a) (i) Solve the DE $(D^2 + 2D + 1)\, y = x^3 + \cos 2x$. **(8)**

(ii) Solve the DE $[x^2D^2 + 3xD + 5]\, y = \cos(\log x)$. **(8)**

OR

(b) (i) Solve $(2x + 3)^2 \frac{d^2y}{dx^2} - 2(2x + 3)\frac{dy}{dx} - 12\, y = 6x$. **(8)**

(ii) Solve the simultaneous DES. $Dx + y = \sin t$, $x + Dy = \cos t$ given that $x = 2$ and $y = 0$ at $t = 0$. **(8)**
