DATTA MEGHE COLLEGE OF ENGINEERING AIROLI, NAVI MUMBAI

FE SEM I INTERNAL TEST 1 (2014-15)

APPLIED MATHEMATICS I

Time: 1 Hour

Total Marks:20

N.B.: (1) Attempt any four questions
(2) Figures to the right indicate full marks

Q1. Prove that $\left(\frac{1+\tanh x}{1-\tanh x}\right)^3 = \cosh 6x + \sinh 6x$ [05]

Q2. Show that $x^5 - 1 = (x-1)\left(x^2 + 2x\cos\frac{\pi}{5} + 1\right)\left(x^2 + 2x\cos\frac{3\pi}{5} + 1\right)$ [05]

Q3. Using DeMoivre's Theorem prove that $2(1+\cos 8\theta) = \left(x^4 - 4x^2 + 2\right)^2$ where $x = 2\cos\theta$ [05]

Q4. Simplify $\left(\frac{1+\sin\frac{\pi}{8} + i\cos\frac{\pi}{8}}{1+\sin\frac{\pi}{8} - i\cos\frac{\pi}{8}}\right)^8$ [05]

$x^2+2x+2=0$

2

2

$(x-2)(x-2)=0$

Q5. Prove that $\sin^{-1}(\operatorname{cosec}\theta) = \frac{\pi}{2} + i\log\cot\frac{\theta}{2}$ [05]

Q6. If $\tan\left(\frac{\pi}{3} + i\alpha\right) = x + iy$ prove that $x^2 + y^2 - \frac{2x}{\sqrt{3}} = 1$ [05]

Q7. If $\frac{(1+i)^{x+iy}}{(1-i)^{x-iy}} = \alpha + i\beta$ then considering only principle values, prove that [05]

$\tan^{-1}\left(\frac{\beta}{\alpha}\right) = \frac{\pi x}{2} + y\log 2$

$\sin(0) = \cos 0$
$0 = 1$

Q8. If $\sin^4\theta\cos^3\theta = a_1\cos\theta + a_3\cos 3\theta + a_5\cos 5\theta + a_7\cos 7\theta$ prove that [05]

$a_1 + 9a_3 + 25a_5 + 49a_7 = 0$

$\frac{2\times 180}{3}$