F.E./Sem-I/Old/ AM-I 05/12/14

(OLD COURSE) Q.P. NO : **11895**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions from remaining.
(3) Answer to **subquestions** should be written **together.**

1. (a) P. T. $\frac{1+\cos\alpha+i\sin\alpha}{1-\cos\alpha+i\sin\alpha}=\cot\left(\frac{\alpha}{2}\right)e^{i\left(\alpha-\pi/2\right)}$ 3

(b) If $y=x^2e^x\cos x$: find y_n 3

(c) P. T. $\tanh^{-1}x=x+\frac{x^3}{3}+\frac{x^5}{5}+\frac{x^7}{7}+\ldots\ldots$ 3

(d) If $u=\frac{e^{x+y+z}}{e^x+e^y+e^z}$ S.T. $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}=2u$ 3

(e) Find $[(\bar{a}\times\bar{b})\times(\bar{c}\times\bar{d})]+[(\bar{b}\times\bar{c})\times(\bar{a}\times\bar{d})]+[(\bar{c}\times\bar{a})\times(\bar{b}\times\bar{d})]$ 4

(f) If the temp T at any print (x, y, z) on the surface of the sphere $x^2+y^2+z^2=1$ is $T=400\,xyz^2$. Find heighest tempreture. 4

2. (a) Find z if $\arg(z+1)=\frac{\pi}{6}$ & $\arg(z-1)=\frac{2\pi}{3}$ 6

(b) If $\sin(\theta+i\phi)=\tan\alpha+i\sec\alpha$ then S.T. $\cos 2\theta\cosh 2\phi=3$. 6

(c) If $u=\frac{x^3y^3z^3}{x^3+y^3+z^3}+\cos\left[\frac{x^2+y^2+z^2}{xy+yz+zx}\right]$ 8

find $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z}$

3. (a) If $f(x)=x(x+1)(x+2)(x+3)$; S.T. $f'(x)=0$ has at least three real roots in [-3, 0]. 6

(b) Verify the formula that $\frac{d}{dt}(\bar{A}+\bar{B})=\bar{A}\times\frac{d\bar{B}}{dt}+\frac{d\bar{A}}{dt}\times\bar{B}$ for 6

$\bar{A}=5t^2i+tj-t^3k$ & $\bar{B}=\sin t\,i-\cos t\,j$ 8

(c) Expand $\sin^{-1}x$ in assending powers of x upto the term x^7.

Correction