QP Code : 3075

(OLD COURSE)

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

N.B. : (1) Questions No. **1** is **compulsory.**
(2) Attempt any **four** questions form **2 to 7.**
(3) Answer to subquestion should be written together.

Correction Attached 01

1. (a) P.T. amp ($z_1 . z_2$) = am (z_1) + amp (z_2). 3
(b) Find y_n where $y = \sin^4 x$. 3
(c) P.T. $[(\bar{a} \times \bar{b}) \times (\bar{a} \times \bar{c}).\bar{d} = (\bar{a}.\bar{d})[\bar{a}\,\bar{b}\,\bar{c}]$. 3
(d) P.T. $\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \ldots$ 3
(e) If $u = e^{xyz}$ then S.T. 4

$$\frac{\partial^3 u}{\partial x \partial y \partial z} = [1 + 3xyz + x^2 y^2 z^2]e^{xyz}$$

(f) Divide a in three parts such that their product is maximum. 4

2. (a) If $\sin\theta + \sin\phi = 0$ and $\cos\theta + \cos\phi = 0$ then prove that $\sin(2\theta) + \sin(2\phi) = 2\sin(\pi + \theta + \phi)$. 6
(b) Separate into real and imaginary parts of $\tanh^{-1}(x + iy)$ 6
(c) State and prove Euler's Thm for 2 variables and hence find 8

$$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} \text{ where}$$

$$u = x^3 \tan^{-1}\left(\frac{x^3 + y^3}{x^3 - y^3}\right)$$

3. (a) Verify Rolle's Throm for $f(x) = \log\left[\frac{x^2 + ab}{(a+b)x}\right]$ in [a, b] ; a, b>0. 6

(b) P.T. $(\bar{a} \times \bar{b}), (\bar{b} \times \bar{c}), (\bar{c} \times \bar{a})$ are coplanar if and only if $\bar{a}, \bar{b}, \bar{c}$ are coplanar. 6

(c) Prove that $\log(1 + e^x) = \log 2 + \frac{1}{2}x + \frac{x^2}{8} - \frac{1}{192}x^4 + \ldots$ 8

FE-I (old)
AM-I

QP Code : **3075**

4. (a) Solve $x^7+x^4+i(x^3+1)=0$ **6**

(b) Test the convergence of $\sum \frac{3^n+4^n}{4^n+5^n}$ **6**

(c) If $Y=\sinh^{-1}x$ then prove that $(1+x^2)\,y_{n+2}+(2n+1)\,x\,y_{n+1}+n^2\,y_n=0$ **8**

5. (a) If $Y=X\log\left(\frac{x-1}{x+1}\right)$ then S.T. **6**

$$y_n=(-1)^{n-2}\,(n-2)\,!\left[\frac{x-n}{(x-1)^n}-\frac{x+n}{(x+1)^n}\right]$$

(b) Evaluate $\lim_{x\to y}\frac{x^y-y^x}{x^x-y^y}$ **6**

(c) Find Divergense $\overline{F}$ and curl $\overline{F}$ where $\overline{F}=\nabla(x^3+y^3+z^3-3xyz)$. **8**

6. (a) If $z=f(x,y)$ and
$x=u\cos\alpha-t\sin\alpha$
$y=u\sin\alpha+t\cos\alpha$ P.T. **6**

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

(b) Find directional derivative of $\phi=xy^2+yz^3$ at point (2, -1, 1) towords the point (3, 1, 3) **6**

(c) If $\cos\left(\frac{\pi}{4}+ia\right)\cosh\left(b+i\frac{\pi}{4}\right)=1$ then **8**

S.T. $2b=\log(2+\sqrt{3})$

[TURN OVER]

QP Code : 3075

7. (a) If $u = \frac{1}{\sqrt{x^2 + y^2 + z^2}}$, then find **6**

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2}$$

(b) Find the extreme value of $x^3 + y^3 - 3axy$; $(a > o)$. **6**

(c) If $\frac{(1+i)^{x+iy}}{(1-i)^{x-iy}} = \alpha + i\beta$ then **8**

Considering only principal values S.T.

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

MUPD150253 NUMAN-ISLAMS KALSEKAR TECHNICAL CAMPUS, COLLEGE OF ENGINEE

Course: F.E. (OLD) (ALL BRANCHES) (SEM-I)(Prog-568)

Q.P Code: 3075

Correction:

Q.6 @

Read as

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

instead of

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

Query Update time: 12/05/2015 12:00 AM

Note : Take printouts and submit them to all concerned students.