LAST MOMENT TUITIONS

APPLIED MATHS III

MAY-2018

S.E.SEM-III

Total marks: 80

Total time: 3 Hours

INSTRUCTIONS:

(1) Question 1 is compulsory.

(2) Attempt any three from the remaining questions.

(3) Draw neat diagrams wherever necessary.

Q.1 (a)Find the Laplace's transform of e^{-4t}sinh t sint. **(20)**

(b)Find half range series for f(x)=$\frac{\pi}{4}$ in (0,π).

(c)Find the values of Z for which the following function is not analytic

Z=sinh ucosv+ i cosh usinv.

(d)Show that $\nabla\left[\frac{(\bar{a}.\bar{f})}{r^n}\right]=\frac{\bar{a}}{r^n}-\frac{n(\bar{a}.\bar{r})\bar{r}}{r^{n+2}}$,where $\bar{a}$ is a constant vector.

Q.2(a)Find the inverse Z-transform of F(z)=$\frac{1}{(z-3)(z-2)}$ if $|z|$<2 **(06)**

(b)Verify Laplace's equation for u=(r+$\frac{a^2}{r}$)cosθ also find v and f(z). **(06)**

(c)Find the fourier series for the periodic function **(08)**

f(x)=$\begin{cases} -\pi, -\pi < x < 0 \\ x, 0 < x < \pi \end{cases}$

State the value pf f(x) at x=0 and hence ,deduce that

$$\sum_{n=1}^{\infty}\frac{1}{(2n-1)^2}=\frac{\pi^2}{8}$$

Q.3(a)Find $L^{-1}\left[\frac{1}{(S-3)(S-3)^2}\right]$ using convolution theorem. **(06)**

(b)Show tthat the set of functions sinx, sin2x, sin3x,.......... is orthogonal on the interval[0,π] **(06)**

(c)Verify Green's theorem for $\int_c \bar{F}.d\bar{r}$ where $\bar{F}$=x^3i + xyj and c is the triangle whose vertices are (0,2),(2,0) and (4,2) **(08)**

Q.4(a)Find Laplaces transform of f(t)=$\begin{cases} a\ sinp\ t, o < t < \frac{\pi}{p} \\ 0, \frac{\pi}{p} < t < \frac{2\pi}{p} \end{cases}$ and f(t)=f(t+$\frac{2\pi}{p}$). **(06)**

(b)Show that $\bar{F}$ =(y2-z2+3yz-2x)I + (3xz +2xy)j+(3xy-2xz+2z)k is both solenoidal and irrotational. **(06)**

(c)Find half range cosine series for f(x)=x , 0<x<2. **(08)**

Hence deduce that $\frac{4}{90} = \frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \frac{1}{4^4} + ----$

Q.5(a)Show that $\iint_s [\nabla r^n].d\bar{s} = n(n+1)\iiint_v r^{n-2}dv$ using Gauss's Divergance theorem. **(06)**

(b)Find the Z-transform of $\{k^2e^{-ak}\}$,k$\geq$ 0. **(06)**

(c) i. Find $L^{-1}\left[\frac{s^2+2s+3}{(s^2+2+2)(s^2+2+5)}\right]$ **(08)**

ii.Find $L^{-1}\left[\frac{s^2+a^2}{\sqrt{s+b}}\right]$

Q.6(a)Use Laplaces transform to solve , **(06)**

$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 8y = 1$,where y(0)=0,y'(0)=1

(b)Find the bilinear transformation which maps the points z=∞,I,0 onto the points 0,I,∞ respectively of w-plane. **(06)**

(c)Express the function f(x)=$\begin{cases} \frac{\pi}{2}, for\ 0 < x < \pi \\ 0, for\ x > \pi \end{cases}$ **(08)**

For fourier sine integral and show that

$\int_0^\infty \frac{1-\cos\pi w}{w}\sin\pi\ dw = \frac{\pi}{2}$ when 0<x<π