Registration No: | | | | | | | | | | |

Total Number of Pages: 2

B.TECH
PAT2A001

2nd Semester Regular / Back Examination 2016-17
Applied Mathematics-II
BRANCH: All
Time: 3 Hours
Max Marks: 100
Q.CODE: Z337
Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.

Part – A (Answer all the questions)

Q1 Answer the following questions: ***dash fill up type*** **(2 x 10)**

a) Laplace transform of $e^t \cosh 3t$ = ____________

b) Inverse Laplace transform of $\frac{5s}{s^2-25}$ = ____________

c) Laplace transform of $4u(t-\pi)\cos t$ = _____________

d) The period of the function $\cos\left(\frac{3\pi x}{2}\right)$ = _____________

e) The derivative of $\vec{F}(t) = te^t\hat{i} + t^2\hat{j} + \sin t\hat{k}$ = ____________

f) If $\vec{F} = xyz(x\hat{i} + y\hat{j} + z\hat{k})$ then $\vec{\nabla}\cdot\vec{F}$ = __________________________

g) If $\vec{F} = x\hat{i} + 2y\hat{j} - z\hat{k}$ then $\vec{\nabla}\cdot(\vec{\nabla}\times\vec{F})$ = ___________________

h) For the surface $4x^2+9y^2=1$ write down the parametric expression $\vec{r}(u,v)$: ____________________

i) The Fourier series for the function $\sin^2 x$ = _________________

j) The value of $\beta(3,4)$ = ____________________

Q2 Answer the following questions: ***Short answer type*** **(2 x 10)**

a) Find the constant term in the Fourier series for the function $f(x) = x^2$, with period 2π.

b) Evaluate $\int_0^2\int_0^1 x\, dx\, dy$

c) Find out the unit surface normal to the surface of the cone $\vec{r}(u,v) = u\cos v\ \hat{i} + u\sin v\ \hat{j} + cu\ \hat{k}$.

d) Find the curl of the function $\vec{F} = xyz(x\hat{i} + y\hat{j} + z\hat{k})$.

e) Find the length of the curve $\vec{r}(t) = \cos t\ \hat{i} + \sin t\ \hat{j} + t\ \hat{k}$ from (1, 0, 0) to (1, 0, 2π).

f) Find the directional derivative of the function $f = xyz$ at (–1, 1, 3) in the direction $\vec{a} = \hat{i} - 2\hat{j} + 2\hat{k}$.

g) Using the value $\Gamma(0.5) = \sqrt{\pi}$, compute $\Gamma(-3.5)$.

h) Find the Laplace transform of $f(t)=\begin{cases} t, & 0<t<2 \\ 0, & otherwise \end{cases}$.

i) Find the inverse Laplace transform of $\frac{3}{s^2+6s+18}$.

j) Find the inverse Laplace transform of $\ln\frac{s+a}{s+b}$.

Part – B (Answer any four questions)

Q3 a) Solve $y''+y=2\cos t,\ y(0)=3,\ y'(0)=4$ using Laplace transform. **(10)**

b) Find the inverse Laplace transform of $\frac{3(1-e^{-\pi s})}{s^2+9}$ **(5)**

Q4 a) Solve $y''+4y=r(t),\ r(t)=1\ if\ 0<r<1\ \&\ 0 if\ \ t>1,\ \ y(0)=1,\ y'(0)=0.$ **(10)**

b) Solve $y(t)=1+\int_0^t y(\tau)d\tau$. **(5)**

Q5 a) Show that $\left[\int_0^\infty xe^{-x^8}dx\right]\times\left[\int_0^\infty x^2e^{-x^4}dx\right]=\frac{\Gamma(0.5)\Gamma(0.75)}{32}$ **(10)**

b) Evaluate $\int_C \vec{F}\cdot d\vec{r}$ where $\vec{F}=xy\,\hat{i}+x^2y^2\,\hat{j},\ C: y=x^2,\ from\ (0,0)\ to\ (1,4)$ **(5)**

Q6 a) Evaluate $\int_0^{\pi/4}\int_x^{\pi/4}\frac{\sin y}{y}dydx$ **(10)**

b) Find the area enclosed by the cardioids r = a(1 – cosθ) **(5)**

Q7 a) Evaluate $\iint_S \vec{F}\cdot\hat{n}dA$ where **(10)**

$\vec{F}=x\,\hat{i}+y\,\hat{j}+z\,\hat{k},\ S:\vec{r}=u\cos v\,\hat{i}+u\sin v\,\hat{j}+u^2\,\hat{k},\ 0\le u\le 4,\ -\pi\le v\le\pi$

b) Evaluate $\iint_S \vec{F}\cdot\hat{n}dA$ by using divergence theorem where **(5)**

$\vec{F}=\cos y\,\hat{i}+\sin x\,\hat{j}+\cos z\,\hat{k},\ S: the\ surface\ of\ \ x^2+y^2\le 4,\ |z|\le 2$

Q8 a) Find the Fourier series of the function $f(x)=\begin{cases} 0 & -1<x<0 \\ x & 0<x<1 \end{cases}$ with period 2. **(10)**

b) Find the Fourier sine series of the function $f(x)=\pi-x,\ 0\le x\le\pi$. **(5)**

Q9 a) Find the Fourier cosine integral of $f(x)=e^{-x}+e^{-2x},\ x>0.$ **(10)**

b) Find the Fourier transform of the function $f(x)=1,\ a<x<b,\ 0\ otherwise$. **(5)**