SE | III | choice band | ETRX | Am-III | 08/05/18

Q.P. Code: 25013

(3 Hours) *Total Marks :80*

Note: 1) Question No.1 is compulsory
2) Attempt any Three from the remaining

Q1

A) Find Laplace transform of $\sin\sqrt{t}$ 5

B) Prove that u = $-r^3\sin 3\Theta$ is harmonic function also find harmonic conjugate function of u 5

C) Find a fourier series to represent f(x) = $(\frac{\pi-x}{2})^2$ in (0 , 2π) hence deduce that 5

$\frac{\pi^2}{6} = \frac{1}{1}+\frac{1}{4}+\frac{1}{9}+\frac{1}{16}+\ldots\ldots$

D) Find the acute angle between the surface $x^2+y^2+z^2=9$ and $z=x^2+y^2-3$ at (2,-1,2) 5

Q2

A) Prove that $J_{(-3/2)}(x) = -\sqrt{\frac{2}{\pi x}}.(\frac{\cos x}{x}+\sin x)$ 6

B) Find the Bilinear transformation which maps the points z = 1 , i , -1 onto the points w = 0 , 1, ∞ 6

C) Obtain the fourier series for f(x) = $|x|$ in (-π , π) 8

Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1}+\frac{1}{9}+\frac{1}{25}+\ldots\ldots$

Q3

A) Find inverse laplace transform of (i) $2\tanh^{-1}(s)$ (ii) $e^{-4s}.\frac{s}{(s+4)^3}$ 6

B) Find the image of the rectangular region bounded by x=0 , x=3 , y=0 ,y=2 under the bilinear transformation w = z +(1+i) 6

C) Prove that $y = \sqrt{x}\,J_n(x)$ is a solution of the equation , 8

$x^2\frac{d^2y}{dx^2}+(x^2-n^2+\frac{1}{4})y = 0$

Q4

A) Find Complex form of Fourier Series of coshax in (-a , a) 6

B) Use Gauss's Divergence theorem to evaluate $\iint_S \bar{N}.\bar{F}ds$ where $\bar{F}$=4xi +3yj -2zk and S is the surface bounded by x=0 ,y=0 ,z= 0 and 2x +2y +z=4 6

C) Solve using Laplace transform$(D^2+2D+1)y = 3te^{-t}$,given y(0)=4 and y'(0)=2 8

Q5

A Find half range cosine series for f(x)= $\begin{cases} x\ , & 0<x<(\frac{\pi}{2}) \\ \pi-x\ , & (\frac{\pi}{2})<x<\pi \end{cases}$ 6

B) Find inverse Laplace transform of $\frac{1}{(s^2+4s+13)^2}$ using convolution theorem 6

c) Prove that $\bar{F}=(y^2\cos x+z^3)i+(2y\sin x-4)j+(3xz^2+2)k$ is a conservative field .Find (i)Scalar Potential for $\bar{F}$ (ii) The work done in moving an object in this field from (0 ,1,-1) to$(\frac{\pi}{2}, -1, 2)$. 8

Q6

A) Find the Laplace Transform of $e^{-4t}\int_0^t usin3udu$ 6

B) Use stoke's theorem to evaluate $\int_C \bar{F}.\overline{dr}$ where $\bar{F}$ =(2x-y)i-yz^{2}j –y^{2}zk and S is the surface of hemisphere x^2 +y^2+z^2 =a^2 lying above the XY- plane 6

C) Express the function f(x) =$\begin{cases} 1 & , \ |x| < 1 \\ 0 & , \ |x| > 1 \end{cases}$ as Fourier integral .Hence evaluate 8

$\int_0^\infty \frac{sinw.sinwx}{w}\, dw$

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