S.E-III Sem- Biomed.

S.E/III Sem) Choice Based) Bio med) AM III

Applied Maths-III

Q.P. Code: 25476

(16)

Duration : 3 Hours

Max. Marks : 80

N.B. 1) Question No. 1 is compulsory .

2) Attempt any three questions out of the remaining five questions .

3) Figures to the right indicate full marks .

1. (a) Find Laplace transform of $\int_0^t \int_0^t \int_0^t \frac{-e^{6u}}{u} \, .du^3$ 5

(b) Find the Fourier series for $f(x) = x^3$ in $(-\pi,\pi)$ 5

(b) Show that the vector $\vec{F} = \frac{xi + yj}{x^2+y^2}$ is Solenoidal 5

(c) Determine Constant 'm' if F(z)= $r^5 \cos m\theta + i r^m \sin 5\theta$. 5

2. (a) Prove that $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \sin x$. 6

(b) Solve $(D^2 - 3D + 2)y = 4t + e^{3t}$,if $y(0) = 1, Dy(0) = -1$. 6

(c) Obtain half range sine series for $f(x) = \pi x - x^2$ in $(0,\pi)$ and hence deduce that $\frac{\pi^6}{960} = \frac{1}{1^6} + \frac{1}{3^6} + \frac{1}{5^6} + \frac{1}{7^6} + \dots$ 8

3. (a) If $u = (x^2 + y^2 + z^2)$ Prove that Curl(grad u) $=\vec{0}$. 6

(b) Find Fourier series $f(x) = \begin{cases} a(x-l) & -l < x < 0 \\ a(x+l) & 0 < x < l \end{cases}$ 6

(c) Evaluate $\int_0^\infty e^{-3t} \int_0^t (u \sinh^2 u)^2 . \cosh 5u \, e^{3u} \, du.dt$ 8

4. (a) Find the bilinear transformation which maps the points $z = 1, i, -1$ onto the points $w = i, 0, -i$. 6

(b) By using Stoke's theorem evaluate $\int_C \vec{F}.\vec{dr}$ where $\vec{F} = (2x+y)i - 4z^2 j - y^2 z k$ and C is the boundary of the hemisphere $x^2 + y^2 + z^2 = a^2, z = 0$. 6

(c) Find Inverse Laplace transform

i) $\left\{\frac{5s+3}{s^2+6s+25}\right\}$ $\quad$ ii) $\log\left\{\frac{s^2+81}{s^2+36}\right\}$ 8

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5. (a) Define Orthogonal set of functions on (a,b) ,Show that the functions $f_1(x) = 1,\ f_2(x) = 3x$ are orthogonal on (-2,2). Determine the constants P , Q such that $f_3(x) = Px^2 + Qx + 9$ is orthogonal to both $f_1(x)$ & $f_2(x)$ on the same interval. 6

(b) Find the analytic function $f(z) = u + iv$ in terms of Z if $4u - 5v = x^3 + x^2 - 3xy^2 - y^2 - 3yx^2 + y^3 - 2xy$. 6

(c) Verify Green's theorem for $\int_C (4xy - x^2)dx + (2x + 6y^2)dy$, C is the closed curve in the XY-plane bounded by $y = x^2$ and $x = y^2$. 8

6. (a) Find Laplace transform of $f(x) = \begin{cases} \sin 7t & 0 < t < \pi/2 \\ 2 & \pi/2 < t < \pi \end{cases}$ and $f(t) = f(t + \pi)$. 6

(b) Find the invariant points of the Bilinear transformation $w = \left(\frac{4z-9}{z-2}\right)$, also express it in the normal form. 6

(c) Obtain Complex form of Fourier series for $f(x) = \sinh x$ in $(-l, l)$ 8

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