Sanjay Ghodawat University, Kolhapur 2018-19

Established as State Private University under Govt. of Maharashtra. Act No XL, 2017 EXM/P/09/01

Year and Program:2018-19 S.Y.B.Tech	**School of Technology**	**Department: Aeronautical**
Course Code: AET 201	**Course Title: Differential Calculus and Transform**	**Semester – III**
Day and Date: Tuesday 04/06/2019	**End Semester Examination (ESE)**	**Time:** 2.30 to 5.30 pm. **Max Marks: 100**

Instructions:
1) All questions are compulsory.
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks.
4) Use of non-programmable calculator is allowed.

Q.1		Marks	Bloom's Level	CO
a)	Solve $(D+2)(D-1)^2 y = e^{-2x} + 2\sinh x$	07	L_1	CO1
	OR			
a)	Solve $(D-2)^2 y = 8\left(e^{2x} + \sin 2x + x^2\right)$	07	L_1	CO1
b)	Solve $pq = x^m y^n z^{2l}$	08	L_1	CO2
	OR			
b)	Solve $p(1+q^2) = q(z-\alpha)$	08	L_1	CO2
Q.2				
a)	Find the Fourier series expansion of $f(x) = x^2$ in $[0, 2\pi]$ and hence deduce that $\frac{\pi^2}{12} = 1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \frac{1}{5^2} - \frac{1}{6^2} + \ldots$	07	L_2	CO3
	OR			
a)	Find the Fourier series of $f(x) = e^{-ax}$ in the interval $[-\pi, \pi]$	07	L_2	CO3
b)	Find the directional derivative of $\phi = x^2 + y^2 + z^2$ in the direction of the line $\frac{x}{3} = \frac{y}{4} = \frac{z}{5}$ at $(1,2,3)$	08	L_2	CO5

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OR

b)	If $\phi = x^3 + y^3 + z^3 - 3xyz$ find i) $\overline{r}\cdot\nabla\phi$ ii) $div\,\overline{f}$ iii) $curl\,\overline{f}$ where $\overline{f} = \nabla\phi$	08	L2	CO5
Q.3	**Solve any Two**			
a)	Solve $x^2\dfrac{d^2y}{dx^2} - x\dfrac{dy}{dx} - 3y = x^2 \log x$	08	L3	CO1
b)	Solve $z^2(p^2 + q^2) = y^2 + x^2$	08	L3	CO2
c)	Obtain Fourier series expansion for the function $f(x) = x - x^2$ in the interval $-1 < x < 1$	08	L3	CO3
d)	Show that the vector field represented by $\overline{f} = (z^2 + 2x + 3y)i + (3x + 2y + z)j + (y + 2zx)k$ is irrotational but not Solenoidal. Also obtain a scalar function ϕ such that $grad\,\phi = \overline{f}$.	08	L3	CO5
Q.4	**Solve any Three.**			
a)	Find Laplace transform of $e^{-2t}\cosh t.\sin t$	06	L2	CO4
b)	Find Laplace transform of $\dfrac{d}{dt}\left(\dfrac{\sin t}{t}\right)$	06	L2	CO4
c)	Find Laplace transform of $f(t) = \dfrac{\sin^2 t}{t}$	06	L2	CO4
d)	Find Laplace transform of $e^{-3t}\int_0^t u \sin 3u\, du$	06	L2	CO4
Q.5	**Solve any Three.**			
a)	If $f(z) = u + iv$ is analytic and $u - v = e^x(\cos y - \sin y)$,then find $f(z)$ in terms of z	06	L3	CO6
b)	If $f(z)$ is analytic and $\lvert f(z)\rvert$ is constant, then prove that $f(z)$ is constant.	06	L1	CO6

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c)	Using Cauchy-Riemann equations in polar form prove that $\frac{\partial^2 u}{\partial r^2}+\frac{1}{r}\frac{\partial u}{\partial r}+\frac{1}{r^2}\frac{\partial^2 u}{\partial \theta^2}=0$	06	L4	CO6
d)	Show that the following function $u=\sin x.\cosh y+2\cos x.\sinh y+x^2-y^2+4xy$ satisfies Laplace equation. And find corresponding analytic function $f(z)=u+iv$.	06	L4	CO6

Q.6 Solve any Three

a)	Find by using Partial fraction $L^{-1}\left\{\frac{s^2+2s+3}{(s^2+2s+5)(s^2+2s+2)}\right\}$	06	L3	CO4
b)	Find $L^{-1}\left\{\frac{s^2}{(s^2+a^2)^2}\right\}$	06	L3	CO4
c)	Evaluate $\int_c \frac{e^{2z}}{(z-1)(z-2)}dz$, where c is $\lvert z\rvert=3$	06	L2	CO6
d)	Evaluate $\int_c \frac{z+3}{2z^2+3z-2}dz$, where c is circle $\lvert z-i\rvert=2$	06	L2	CO6

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