Year and Program: 2018-19 SY B. Tech | **School of Technology** | **Department : Civil Engineering**

Course Code: CET 201 | **Course Title: Mathematics-III** | **Semester – III**

Day and Date Tuesday 04/06/2019 | **End Semester Examination (ESE)** | **Time:** 3Hrs. 2.30 to 5.30 pm.

Max Marks: 100

Instructions:
1) All questions are compulsory.
2) Figures to the right indicate full marks
3) **Use of Non- Programmable calculator is allowed**
4) Normal table (Z-table) will be provided

Q.		Question	Marks	Bloom's Level	CO
Q.1		**Solve the following**			
	a)	Solve $\frac{d^3y}{dx^3}-3\frac{d^2y}{dx^2}+9\frac{dy}{dx}-27y=\cos 3x$.	07	L3	CO1
		OR			
	a)	Solve $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+y=e^x\sin x$.	07	L3	CO1
	b)	Solve $pz=1+q^2$.	08	L3	CO2
		OR			
	b)	Solve $4x^2y^2z=2x^2y^2(px+qy)+p^2y^2+q^2x^2$ (use $x^2=u$ and $y^2=v$).	08	L3	CO2
Q.2	a)	Expand $f(x)=x-x^2$ as a cosine series for $0\le x\le 1$.	07	L3	CO3
		OR			
	a)	Obtain Fourier series for the function $f(x)=a^2-x^2$ in $(-a,a)$.	07	L4	CO3
	b)	Prove that $\nabla^2(\log r)=\frac{1}{r^2}$.	08	L2	CO4
		OR			
	b)	Find the directional derivative of $\phi=x\log z-y^2+4$ at (-1,2,1) in the direction of $3i+4j+5k$. Also find out in which direction the directional derivative of $\phi=x^2yz^3$ is maximum at the point (2,1,-1).	08	L1	CO4

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Q.3 **Solve any Two**

a)	Solve $x^3\frac{d^3y}{dx^3}+2x^2\frac{d^2y}{dx^2}+2y=10\left(x+\frac{1}{x}\right)$.	08	L3	CO1
b)	Solve $(x+y)(p+q)^2+(x-y)(p-q)^2=1$.	08	L3	CO2
c)	Obtain the Fourier expansion for the function $f(x)=e^{-x}$; $0\le x\le 2\pi$	08		CO3
d)	If $\overline{f}=\nabla(xy+yz+zx)$ then find $div\,\overline{f}$ and $curl\,\overline{f}$. Also prove that if $\overline{g}=(x+y+1)i+j-(x+y)k$ then $\overline{g}.(curl\,\overline{g})=0$.	08	L1	CO4

Q.4 **Solve any Two**

a) Find the area under the normal curve in each of the following cases — 09 L4 CO5

i) $z=0$ and $z=1.2$ ii) $z=-0.68$ and $z=0$

iii) $z=0.81$ and $z=1.94$ iv) To the right of $z=-1.28$

b) In a sampling the mean number of defective bolls manufactured by a machine in a sample of 20 is 2. Determine the expected number of samples out of such 500 samples to contains — 09 L3 CO5

i. Zero defective bolls
ii. One defective bolls
iii. at least 2 defective bolls

c) A random variable X has the following probability distribution — 09 L1 CO5

X	0	1	2	3	4	5	6
P(X)	m	$3m$	$5m$	$7m$	$9m$	$11m$	$13m$

i. Then find the value of m

ii. Evaluate $P(X<4)$, $P(X\ge 5)$ and $P(3<X\le 6)$

Q.5 **Solve any Two**

a) Using Couchy-Riemann equations in polar form prove that — 09 L3 CO6

$\frac{\partial^2 u}{\partial r^2}+\frac{1}{r}\frac{\partial u}{\partial r}+\frac{1}{r^2}\frac{\partial^2 u}{\partial\theta^2}=0$ .Also find $\frac{dw}{dz}$ if $w=z^n$.

b) Find an analytic function whose real part is $e^{-x}\{(x^2-y^2)\cos y+2xy\sin y\}$. — 09 L1 CO6

c) If $w=\log z$ then determine whether w is analytic also find $\frac{dw}{dz}$. — 09 L1 CO6

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Q.6		**Solve any Three**			
	a)	From a Box containing 100 transistors, 20 of which are defective, 10 are selected at random. Find the probability that i. All will be defective ii. Zero will be defective iii. At least one is defective.	06	L1	CO5
	b)	In a sample of 1000 students the mean and standard deviation of marks obtained by the students in a certain test are 14 and 2.5 , assuming the distribution to be normal, find the number of students getting marks between 12 and 15.	06	L4	CO5
	c)	Find the value of p if the function $f(z) = r^2 \cos 2\theta + ir^2 \sin p\theta$ is analytic.	06	L1	CO6
	d)	Show that the function $f(z) = e^{100z}$ is analytic.	06	L2	CO6

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