Reg. No. : | | | | | | | | | | |

Question Paper Code: 92002

B.E./B.Tech. DEGREE EXAMINATION, AUGUST 2021

Second Semester

19UMA202- Calculus , Fourier Series And Numerical Methods

Mechanical Engineering

(Regulation 2019)

Duration: 1.45 hrs | Maximum: 50 Marks

PART A (Answer Any Ten) 10*2 = 20 Marks

1.	Calculate the iterative formula for finding the value of $\sqrt{N}$ where N is a real number	CO1 – App
2.	Apply Gauss Elimination method solve the system of equations $x+y=2$; $2x+3y=5$	CO1 – App
3.	Investigate whether the system of equations $28x+4y-z=32$; $x+3y+10z=24$; $2x+17y+4z=35$ are diagonally dominant or not?	CO1 – App
4.	Compute the order and degree of $(y''')^2+2(y'')^3+y=0$	CO6 – App
5.	Determine the Particular Integral of $(D^2-2D+1)y=\sinh x$	CO2 – App
6.	Solve $(x^2D^2-xD+1)y=0$	CO2 – App
7.	Compute the values of a,b,c so that the vector $\vec{F}=(x+y+az)\vec{i}+(bx+2y-z)\vec{j}+(-x+cy+2z)\vec{k}$ is Irrotational	CO6 –App
8.	Calculate the unit normal vector to the surface $x^2+y^2+z^2=1$ at $(1,1,1)$.	CO3 –App
9	Show that $\nabla(r^n)=nr^{n-2}\vec{r}$	CO3 –App
10	Explain why tanx cannot be expanded as a Fourier series	CO6 – App
11	Calculate a_0 and a_n in the Fourier series expansion of $f(x)=x+x^3$ in $(-\pi,\pi)$	CO4 – App
12	Determine the root mean square value of the function $f(x)=x$ in $(0,1)$	CO4 – App

13 Determine the Fourier transform of $\mathbf{f(x)} = \begin{cases} \mathbf{1} & \mathbf{|x| \le 2} \\ \mathbf{0} & \mathbf{|x| > 2} \end{cases}$ CO5 – App

14 Determine the Fourier Sine transform of e^{-ax} CO5 – App

15 State and Prove Modulation theorem of Fourier Transform CO5 – App

PART B (Answer Any Three) 3*10 = 30 Marks

16. Calculate the largest Eigen value of the matrix $\begin{pmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{pmatrix}$ by power method. CO1-App (10)

17 Apply the method of variation of parameter technique solve $\left(D^2 + a^2\right)y = \tan ax$ CO2-App (10)

18 Verify Gauss divergence theorem for the vector function $\vec{F} = 4xz\vec{i} - y^2\vec{j} + yz\vec{k}$ over the cube bounded by $x = 0, y = 0, z = 0$ and $x = 1, y = 1, z = 1$. CO3- App (10)

19 Determine the Fourier series for $f(x) = x^2$ in $0 < x < 2\pi$ CO4- App (10)

20 Determine the Fourier Transform of the function defined by $f(x) = \begin{cases} \mathbf{1 - x^2} & \mathbf{if\ |x| < 1} \\ \mathbf{0} & \mathbf{if\ |x| \ge 1} \end{cases}$ and hence Prove that (i) $\int_0^\infty \frac{\mathbf{sint - tcost}}{\mathbf{t^3}}\mathbf{dt} = \pi/4$ (ii) $\int_0^\infty \left(\frac{\mathbf{sint - tcost}}{\mathbf{t^3}}\right)^2 \mathbf{dt} = \pi/15$ CO5- App (10)