Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech.**
15BS1104

2nd Semester Back Examination 2017-18
MATHEMATICS-II
BRANCH : AEIE, AERO, AUTO,
BIOMED, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ENV, ETC, FASHION, FAT, IEE, IT, ITE, MANUFAC, MANUTECH, MARINE, MECH, METTA, METTAMIN, MINERAL, MINING, MME, PE, PLASTIC, TEXTILE
Time : 3 Hours
Max Marks : 100
Q.CODE : C600
Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Part – A (Answer all the questions)

Q1 **Answer the following questions:** ***multiple type or dash fill up type:*** **(2 x 10)**

a) What is the Fundamental period of $f(x) = \sin(2018x + 2015)$
(a) $\frac{2\pi}{2015}$ (b) $\frac{2\pi}{2016}$ (c) $\frac{2\pi}{2018}$ (d) none

b) What is the value of $L[\delta(t)]$,where $\delta(t)$ is the unit impulse function
(a) 0 (b) 10 (c) 100 (d) none

c) The value $of \iint_R f(x,y)dxdy$, where $f(x,y) = x; R: 0 \le x \le 1, 0 \le y \le 2$ is__________________.

d) $L^{-1}[\frac{1}{(s-5)^2}]$ =_____________.

e) The curl of $xyz^2 i + yzx^2 j + zxy^2 k \ at \ (1,2,3)$ is____________.

f) Let $U(t)$ be the unit step function then, the Laplace transformation of $f(t) = (t-5)U(t-5)$ is_____________.

g) What is the coefficient of $\cos nx$ in Fourier series expansion of
The function $f(x) = \frac{\pi^2}{12} - \frac{x^2}{12}$ in $(-\pi, \pi)$
a) $1 - (-1)^n$ (b) π (c) 0 (d) none

h) The Fourier sine transformation of the function f(x)= e^{-2x} is __________.

i) The value of Convolution $2 * \sin 2t$ is_________.

j) Let $f(x,y,z)$ be any scalar function then grad $[f(x,y,z)]$ is a
(a) Scalar function (b) vector function (c) constant function (d) none

Q2 **Answer the following questions:** ***Short answer type:*** **(2 x 10)**

a) What is the relation between Beta function and gamma functions and also find $\beta(5,3)$.

b) Evaluate $\int_0^1 x^4 e^{-x} dx$

c) If $f(x,y) = x^2 \cos y$ then what is the value of $\nabla^2 f$ at $(0,0)$.

d) What is the value of $L[\mathrm{g}(t)]$ where $g(t) = \begin{cases} 0, & t \le \frac{1}{2} \\ t + \frac{3}{2}, & t > \frac{1}{2} \end{cases}$

e) Using Convolution, find the value of $L^{-1}\left[\frac{1}{s^2(s^2+1)}\right]$.

f) Evaluate $L[t^2 \cos t]$.

g) Find the Directional derivative of the function f = $e^x + e^y$ at a point p (0,0) in the direction of the vector $\vec{a} = 2\hat{\imath} - 4\hat{\jmath}$.

h) The value of $\int_C F(r)\cdot dr, where\ F=[y^2,-x^2]$ and C: Be the line segment from (0, 0) to (4, 4).

i) Find a parametric representation of the equation of sphere $x^2+y^2+z^2=1$.

j) Find the coefficient of $\sin nx$ in the Fourier series expansion of $f(x)=x^2\ (0<x<2\pi)$

Part – B (Answer any four questions)

Q3 a) Solve the following integral equation using Laplace transformation $y(t)=\sin 2t+\int_0^t \sin 2(t-u)y(u)du$ **(10)**

b) Show that $\Gamma(n+1)=n!$ where n is a positive integer. **(5)**

Q4 a) Solve the following initial value problem using Laplace transformation $\frac{d^2y}{dt^2}-8\frac{dy}{dt}+15y=9te^{2t}\ with\ y(0)=5, y'(0)=10$ **(10)**

b) Show that $L\left[\frac{\cos at}{t}\right]$ does not exist. **(5)**

Q5 a) Evaluate the Surface integral $\iint_S F\cdot n\,dA$ by Gauss divergence theorem where, $F=[\cos y,\sin x,\cos z], s$ is the surface of $x^2+y^2\le 4, |z|\le 2$. **(10)**

b) Evaluate $\int_C F\cdot dr$ where $F=(x^2+y^2)i+xyj$ and C be the arc of the curve $y=x^3$ from $(0,0)\ to\ (3,9)$. **(5)**

Q6 a) Find the polar moment of inertia about the origin of the mass of the density $f(x,y)=2018$ in the region : $0\le y\le 1-x^2, 0\le x\le 2$. **(10)**

b) Find the coordinates of the center of gravity of a mass of density f$(x,y)=1$ in the region R :the triangle with vertices $(0,0),(b,0)\ and\ (b,h)$. **(5)**

Q7 a) Find the Fourier series expansion of $f(x)=\begin{cases} x & if\ 0<x<1 \\ 1-x & if\ 1<x<2 \end{cases}$ with period P = 2. **(10)**

b) Find the Fourier Transformation of $(x)=\begin{cases} e^{x} ; & x<0 \\ e^{-x}; & x>0 \end{cases}$. **(5)**

Q8 a) Verify Stokes Theorem, when F= $y\hat{\imath}+(x-2xz)\hat{\jmath}-xy\hat{k}$ and surface 'S' is the part of the sphere $x^2+y^2+z^2=4$ above the xy plane. **(10)**

b) Find the coordinates of the center of gravity of a mass of density f$(x,y)=1$ in the region R : $x^2+y^2\le 1$ in the first octant. **(5)**

Q9 a) Prove that the Fourier integral $\int_0^\infty \frac{\cos \omega x}{1+\omega^2}d\omega=\frac{\pi}{2}e^{-x}\ for\ x>0$ **(10)**

b) Using Gamma function evaluate $\int_0^\infty x^6 e^{-3x}dx$. **(5)**