Registration No :

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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) $\pi$ (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 **(10)**

$\frac{d^2y}{dt^2} - 8\frac{dy}{dt} + 15y = 9te^{2t}\ with\ y(0) = 5, y'(0) = 10$

**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)**