Registration No :

Total Number of Pages : 02

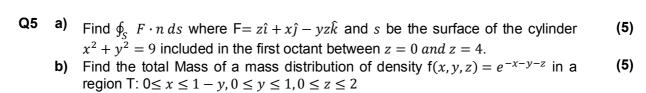**B.Tech.**
BS1104

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 : 70
Q.CODE : C601
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Q1 **Answer the following questions :** **(2 x 10)**

a) Find $L[e^{-t} \cos 2t]$.

b) Find $L[f(t)]$, Where $f(t) = \begin{cases} 4; 0 < t < 1 \\ 5; 2 < t < 4 \\ 6; \quad t > 4 \end{cases}$

c) The Fourier sine transformation of the function f(x)= x^2 if 0< x <1 and f(x) = 0 if x > 1 .

d) Find the Directional derivative of the function f $= x - y$ at a point p (4,5) in the direction $\vec{a} = 2\hat{\imath} + \hat{\jmath}$

e) Find the Laplace transformation of the unit impulse function $\delta(t - 1)$ and The unit step function $U(t - 5)$.

f) What is the value of $\iint_R 2\, dx\, dy$, $R: 0 \le x \le 1, 0 \le y \le \sqrt{1 - x^2}$?

g) Find the unit normal vector of the surface $x^2 - y^2 + z^2 = 1$

h) Evaluate $L^{-1}\left[\frac{1}{(s^2+1)(s+1)}\right]$.

i) Find the value of $e^{3t} * e^{2t}$.

j) Find $\nabla^2 f$ $where$ $f = e^{2x} \sin 2y$.

Q2 **a)** Solve the following initial value problem using Laplace transformation $\frac{d^2y}{dt^2} - \frac{dy}{dt} - 2y = 4x^2$ $with$ $y(0) = 1, y'(0) = 4$? **(5)**

b) Solve the following integral equation using Laplace transformation $t = 1 + \int_0^t \sin(t - u) y(u) du$. **(5)**

Q3 **a)** 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)**

b) Prove that $L\left(\frac{\sin \alpha t}{t}\right) = \cot^{-1}\left(\frac{s}{\alpha}\right), \alpha > 0$ **(5)**

Q4 **a)** Find the Fourier series expansion of $f(x) = \begin{cases} x & if\ 0 < x < 1 \\ 1 - x & if \quad 1 < x < 2 \end{cases}$ of period p = 2 . **(5)**

b) Find the Fourier series expansion of $f(x) = \begin{cases} x\ if\ -\frac{\pi}{2} < x \le \frac{\pi}{2} \\ 0\ if \quad \frac{\pi}{2} < x < \frac{3\pi}{2} \end{cases}$ **(5)**

Q5 **a)** Find $\oint_S F \cdot n\, ds$ where $F = z\hat{\imath} + x\hat{\jmath} - yz\hat{k}$ and s be the surface of the cylinder **(5)**
$x^2 + y^2 = 9$ included in the first octant between $z = 0 \ and \ z = 4$.

b) Find the total Mass of a mass distribution of density $f(x, y, z) = e^{-x-y-z}$ in a **(5)**
region T: $0 \le x \le 1 - y, 0 \le y \le 1, 0 \le z \le 2$

Q6 **a)** Using Green's Theorem find the line integral **(5)**
$\oint_C (y\, dx - x\, dy)$, Where, 'C' is the circle $x^2 + y^2 = \frac{1}{4}$.

b) Find the area of the region in the first quadrant under the arc of the **(5)**
Limacon $r = 1 + 2\cos\theta ; 0 \le \theta \le \frac{\pi}{2}$.

Q7 Prove that the integral $\int_0^\infty \frac{\cos \omega x + \omega \sin \omega x}{1+\omega^2} d\omega = \begin{cases} 0 ; & x < 0 \\ \frac{\pi}{2} ; & x = 0 \\ \pi e^{-x} ; & x > 0 \end{cases}$ **(10)**

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) Find $L[t^2 \sin 2t]$.

b) Evaluate $L^{-1}\left[\frac{s+4}{(s^2+4s+8)}\right]$.

c) Find $\Gamma(-\frac{9}{2})$.

d) Find the Fourier cosine series expansion of $f(x) = 2 - x \ (0 < x < \pi)$.