Code No: 132AB **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year II Semester Examinations, May - 2019
MATHEMATICS-II
(Common to EEE, ECE, CSE, EIE, IT, ETM)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) Find $L^{-1}\left(\frac{1}{(s-2)^2}\right)$. [2]

b) Define Unit step function and find its Laplace transform. [3]

c) Evaluate $\Gamma\left(-\frac{3}{2}\right)$. [2]

d) Evaluate $\int_0^1 x^5(1-x)^6 dx$ [3]

e) Using triple integral, find the volume of a rectangular box whose length is 6 ft, breadth is 5 ft and height is 4 ft. [2]

f) Evaluate $\int_1^2\int_0^x (x+y^2)dydx$ [3]

g) Define solenoidal vector. [2]

h) Prove that $\bar{r}$ is an irrotational where $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$ [3]

i) State stokes theorem. [2]

j) Evaluate $\iiint_V div\bar{f}\ dxdydz$ where v is the volume of the sphere whose radius is 'a' units and $\bar{f} = x\bar{i} + y\bar{j} + z\bar{k}$. [3]

PART-B

(50 Marks)

2.a) Find the Laplace transform of $(\sin t + \cos t)^2$

b) Find the inverse Laplace transform of $\frac{1}{(s^2+1)(s+1)}$. [5+5]

OR

3. Solve $y'' + 2y' + 5y = e^{-t}$, $y(0)=1$, $y'(0)=1$ using Laplace transform. [10]

4.a) Evaluate $\int_0^\infty e^{-x/3} x^3 dx$.

b) Evaluate $\int_0^1 \frac{xdx}{\sqrt{1-x^4}}$. [5+5]

OR

5.a) Evaluate $\int_0^\infty e^{-x^3} x^7 dx$.

b) Evaluate $\int_0^1 \frac{x^2 dx}{\sqrt{1-x^4}}$. [5+5]

6.a) Evaluate $\int_0^2 \int_0^{\sqrt{2x-x^2}} (x^2+y^2) dxdy$ by changing to polar coordinates.

b) Evaluate $\iint_R ydxdy$ where R is the region bounded by the parabola $y^2 = 4x$ and $x^2 = 4y$. [5+5]

OR

7.a) Evaluate $\iiint xy^2 zdxdydz$ taken through the positive octant of the sphere $x^2+y^2+z^2=a^2$.

b) Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dxdydz$. [5+5]

8.a) Find the directional derivative to the surface f(x,y,z) = xy^2z – 4, at the point (1, -1, 2) along i+j+k.

b) A butterfly is located at (2, -1, 3) and desires to fly towards fragrance surface f(x,y,z)= x^2+yz^2 . Along which direction should it fly to get fragrance at the earliest? [5+5]

OR

9.a) Show that $\nabla^2 r^n = n(n+1)r^{n-2}$ where $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$ and $|\bar{r}|^2 = r$.

b) Prove that $\nabla\left(\frac{1}{r}\right) = -\frac{\bar{r}}{r^3}$ where $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$ and $|\bar{r}|^2 = r$. [5+5]

10. Verify Greens theorem for $\oint_C (y - \sin x)dx + \cos x dy$ where C is the triangle enclosed by the lines $y = 0, x = \frac{\pi}{2}$ and $\pi y = 2x$. [10]

OR

11. Verify stokes theorem for a vector field defined by $\bar{F} = -y^3\bar{i} + x^3\bar{j}$ in the region $x^2+y^2 \le 1,\ z = 0$. [10]

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