Code No: 132AB **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year II Semester Examinations, July/August - 2021
MATHEMATICS-II
(Common to EEE, ECE, CSE, EIE, IT, ETM)

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

Answer any five questions
All questions carry equal marks

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

b) Find the Laplace transform of $f(t)=(\cos t+\sin t)^2$. [7+8]

2. State the convolution theorem on Laplace transforms. Using it find the inverse Laplace transform of $\frac{1}{s(s+1)^3}$. [15]

3.a) Evaluate $\int_0^a x\sqrt{a^3-x^3}\,dx$ using Beta and Gamma functions.

b) Prove that $\beta(m,n)=\frac{\Gamma m\,\Gamma n}{\Gamma(m+n)}$. [7+8]

4.a) Evaluate $\int_0^\infty a^{-bx^2}\,dx$ using Gamma function.

b) Express $\int_0^1 x^m(1-x^n)^p\,dx$ in terms of Beta function and hence evaluate $\int_0^1 x^{\frac{1}{2}}(1-\sqrt{x})^{\frac{3}{2}}\,dx$. [7+8]

5.a) Evaluate $\int_0^1\int_{2y}^2 e^{x^2}\,dx\,dy$ by changing the order of integration.

b) Evaluate $\iint_R xy\,dx\,dy$, where R is the first quadrant of the circle $x^2+y^2=a^2$. [7+8]

6.a) Find the angle between the two surfaces $x^2+y^2+z^2=9$ and $z+3=x^2+y^2$ at (-2, 1, 2).

b) If $\vec{v}=12x\hat{i}-15y^2\hat{j}+\hat{k}$, find a scalar function $f(x,y,z)$ such that $\vec{v}=\nabla f$. [7+8]

7.a) Evaluate the line integral of $\vec{v}=-xy\,\hat{i}+y^2\hat{j}+z\hat{k}$ over the circular path $x^2+y^2=4$, $z=0$ from $(2, 0, 0)$ to $(0, 2, 0)$.

b) Evaluate $\oint_c (3x^2-8y^2)\,dx+(4y-6xy)\,dy$, where c is the boundary of the region defined by $x=0$, $y=0$ and $x+y=1$, by Green's theorem. [7+8]

8. Verify Gauss's divergence theorem for $\vec{v}=4xz\,\hat{i}-y^2\hat{j}+yz\,\hat{k}$ on the surface of the cube bounded by the planes $x=0$, $x=1$, $y=0$, $y=1$, $z=0$ and $z=1$. [15]

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