R16

Code No: 132AB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year II Semester Examinations, June - 2022
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 $L^{-1}\left\{\frac{1}{(s-4)^5}+\frac{5}{(s-2)^2+5^2}+\frac{s+3}{(s+3)^2+6^2}\right\}$.

b) Find $L^{-1}\left\{\frac{1}{(s-1)\sqrt{s}}\right\}$. [9+6]

2.a) Use Laplace transform to prove that $\int_0^\infty \frac{\sin t}{t}dt=\frac{\pi}{4}$.

b) Find the inverse Laplace transform of $\frac{e^{-\pi s}}{s^2+1}$. [7+8]

3.a) Show that $\int_0^1 \frac{x^{m-1}+x^{n-1}}{(1+x)^{m+n}}dx=\beta(m,n)$.

b) Evaluate $\int \sin^5 x\,dx$ and hence find $\int_0^{\frac{\pi}{2}} \sin^5 x\,dx$. [9+6]

4.a) Change the order of integration and solve $\int_0^a\int_{\frac{x^2}{a}}^{2a-x} xy^2\,dx\,dy$.

b) Evaluate $\iint \frac{dxdy}{x^4+y^4}$, over the region bounded by $y\geq x^2$, $x\geq 1$. [7+8]

5.a) Prove that $\nabla\left(\frac{f}{g}\right)=\frac{1}{g^2}(g\,\nabla f-f\,\nabla g)$.

b) Given the velocity potential of a flow, f of a flow, find the velocity $\nabla f=v$ of the field and its value v(P) at P where $f=\cos x\cosh y$, $P:\left(\frac{1}{2}\pi,\ln 2\right)$. [6+9]

6.a) Prove that $\nabla(f^n)=nf^{n-1}\nabla f$.

b) For what points $P(x,y,z)$ does ∇f with $f=25x^2+9y^2+16z^2$ have the direction from P to the origin? [7+8]

7. Evaluate $\int_C \mathbf{F}(\mathbf{r}) \cdot \mathbf{dr}$ around the boundary C of the region R by Green's Theorem, where, $\mathbf{F} = grad(x^3 \cos^2(xy))$ and $R : 1 \leq y \leq 2 - x^2$. [15]

8. Evaluate $\oint_c e^2 dx + 2y\, dy - dz$ by Stoke's theorem when c is the curve $x^2 + y^2 = 4,\ z = 2$. [15]

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