R16

Code No: 131AB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year I Semester Examinations, May/June - 2017

MATHEMATICS-II

(Common to CE, ME, MCT, MMT, MIE, CEE, MSNT)

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 $\lim_{t\to 0} f(t)$, if $L(f(t))=\frac{s}{s^2+w^2}$. [2]

b) Find the inverse Laplace Transform of $\frac{s+5}{(s+1)(s+3)}$. [3]

c) Find the value of $\int_0^\infty \frac{dx}{1+x^4}$. [2]

d) Evaluate $\int_0^1 x^{11}(1-x)^{16}\,dx$. [3]

e) Find the area enclosed between the parabola $y=x^2$ and the line $y=x$. [2]

f) Evaluate $\int_0^{\frac{\pi}{4}} \cos^2 x\,dx$. [3]

g) Find the magnitude of the gradient of the function $f(x,y,z)=xyz^3$ at (1, 0, 2). [2]

h) The velocity vector in 2-dimensional field is $\overline{V}=2xy\bar{i}+(2y^2-x^2)\bar{j}$. Find the $curl\,\overline{V}$. [3]

i) Find the Curl of the gradient of the scalar field $V=2x^2y+3y^2z+4z^2x$. [2]

j) Find the divergence of the vector field $\overline{A}$ at (1, -1, 1) $\overline{A}=x^2z\bar{i}+xy\bar{j}-yz^2\bar{k}$. [3]

Part-B (50 Marks)

2.a) State and prove the second shifting theorem of Laplace Transform.

b) Find $L(F(t))$ if $F(t)=\begin{cases}\sin\left(t-\frac{\pi}{3}\right), & t>\frac{\pi}{3}\\ 0, & t<\frac{\pi}{3}\end{cases}$ [5+5]

OR

3.a) Find the Laplace Transform of $F(t)=a+bt+\frac{c}{\sqrt{t}}$.

b) Solve using Laplace Transform $\frac{d^2y}{dt^2}+\frac{dy}{dt}-2y=3\cos 3t-11\sin 3t$, [illegible] [illegible]]

4.a) Show that $\int_0^{\frac{\pi}{2}}\sqrt{\tan\theta}\,d\theta=\int_0^{\frac{\pi}{2}}\sqrt{\cot\theta}\,d\theta=\frac{\pi}{\sqrt{2}}$.

b) Evaluate $\frac{\beta(m+1,n)}{\beta(m,n)}$. [illegible]5]

OR

5. Show that $\Gamma m\,\Gamma\left(m+\frac{1}{2}\right)=\frac{\sqrt{\pi}}{2^{2m-1}}\Gamma(2m),\ m>0$. [illegible]]

6. Find the mass, center of gravity and moment of inertia relative to [illegible] and origin of a rectangle $0\le x\le 4,\ 0\le y\le 2$ having the mass density function [illegible] xy. [illegible]0]

OR

7. Change the order of integration in $\int_0^1\int_{x^2}^{2-x} xy\,dy\,dx$ and int[illegible] it. [illegible]0]

8.a) Show that $div\left(r^n\overline{r}\right)=(n+3)r^{-n}$.

b) If $\overline{u}=\frac{1}{r}\overline{r}$, find $grad\left(div\,\overline{u}\right)$. [illegible]5]

OR

9.a) Show that $div\left(\overline{A}\times\overline{B}\right)=\overline{B}.curl\overline{A}-\overline{A}.curl\overline{B}$.

b) Find the gradient of the Scalar function $f(x,y,z)=x^2$[illegible] [illegible]5+5]

10. Verify the Gauss's divergence theorem for $\overline{F}=(x^2-yz)\overline{i}+(y^2-zx)\overline{j}+(z^2-xy)\overline{k}$ over the rectangular parallelepiped $0\le x\le a,\ 0\le y\le b,\ 0\le z\le c$. [10]

OR

11. Evaluate $\oint_c x^2dx+2ydy-dz$ by Stoke's theorem where C is the curve $x^2+y^2=4,\ z=2$. [10]

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