Code No: 152AA **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year II Semester Examinations, August - 2019
MATHEMATICS-II
(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, MMT, AE, MIE, PTM)

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) State the Newton's law of cooling. [2]

b) Solve The D.E $\left(D^2+2D+1\right)y=0$. [2]

c) Evaluate $\int_0^2\int_0^1 xydydx$. [2]

d) Find $\nabla.\bar{r}$ [2]

e) State stoke's theorem. [2]

f) Find the integral factor of the differential equation of $\frac{dy}{dx}-y\sin 2x=\cot x$. [3]

g) Find the P.I of $\left(D^2+5D+6\right)y=1+2x+x^2$. [3]

h) Evaluate $\int_{\theta=0}^{\pi}\int_{r=0}^{a\cos\theta} drd\theta$ [3]

i) If $\bar{f}=x^2y\bar{i}-2xz\bar{j}+2yz\bar{k}$ then find Curl $\bar{f}$ [3]

j) Find the work done in moving a particle in the force field $\bar{F}=xi-j+k$ along the straight line from (0,0,0) to (2,1,3). [3]

PART-B

(50 Marks)

2.a) Solve the D.E $p^2+2xp-3x^2=0$ for p.

b) The temperature of the surrounding air is 20^0C. The temperature of a hot body reduces from 100^0C to 70^0C in 1 hr. Find the temperature of the body after 2 hrs. [5+5]

OR

3.a) Solve the D.E $xp^2-2yp+x=0$ for y.

b) Solve the differential equation $\left(x^2+2\sin y\right)dx+\left(2x\cos y+y\right)dy$. [5+5]

4.a) Solve the D.E $\left(D^2-2D+2\right)y=\sin x+e^{-2x}$.

b) Solve the D.E $\left(x+a\right)^2y''-4(x+a)y'+6y=x$. [5+5]

OR

5.a) Solve the D.E $\left(D^2-4\right)y=\cosh\left(2x-1\right)+e^{2x}$.

b) Solve the D.E $x^2y''-xy'+4y=x^2\sin(\log x)$. [5+5]

6.a) Evaluate $\int_0^2 \int_0^{\sqrt{2x-x^2}} (x^2+y^2)\,dx\,dy$ by changing in to polar co-ordinates.

b) Find the volume of ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ [5+5]

OR

7.a) By change of order of integration evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2\,dy\,dx$

b) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dx\,dy\,dz}{\sqrt{1-x^2-y^2-z^2}}$ [5+5]

8.a) Find the directional derivative of $\phi = xyz$ at (1, -1, 1) along the direction which makes equal angles with the positive direction of x , y , z axes.

b) Prove that $\nabla^2\left(r^n\right)=n(n+1)r^{n-2}$ [5+5]

OR

9.a) Find the constants 'a' and 'b' such that the surfaces $5x^2-2yz-9x=0$ and $ax^2y+bz^3=4$ cuts orthogonally at (1,-1,2).

b) Prove that $\bar{F}=2xy\sin z\,i+x^2\sin z\,j+x^2y\cos z\,k$ is irrotational and find its scalar potential. [5+5]

10.a) Evaluate $\iiint_V f(x,y,z)\,dx\,dy\,dz$ where $\bar{f}=3i-j-2k$ bounded by the volume (v) by the planes $x=0$, $y=0$, $z=0$ and $2x+2y+z=4$.

b) Evaluate $\iint_S x^3\,dy\,dz+x^2\,ydx\,dz+x^2z\,dxdy$ over the surface bounded by the planes $z=0$, $z=b$ and the cylinder $x^2+y^2=a^2$ using Gauss divergence theorem [5+5]

OR

11.a) Find the flux of vector function $\bar{F}=(x-2z)\bar{i}\ (x+3y)\bar{j}+(5x+y)\,\bar{k}$ through the upper side of the triangle ABC with vertices (1,0,0), (0,1,0), (0,0,1).

b) Prove that $\oint_c (f\nabla g).dr=\int_s (\nabla f\times\nabla f).\bar{n}\,ds$ using stoke's theorem. [5+5]

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