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 $(D^2 + 2D + 1)y = 0$. [2]

c) Evaluate $\int_0^2 \int_0^1 xy\,dy\,dx$. [2]

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

e) State stoke's theorem. [2]

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

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

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

i) If $\bar{f} = x^2 y\bar{i} - 2xz\bar{j} + 2yz\bar{k}$ 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 $(x^2 + 2\sin y)dx + (2x\cos y + y)dy$. [5+5]

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

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

OR

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

6.a) Evaluate $\int\limits_{0}^{2}\int\limits_{0}^{\sqrt{2x-x^2}}(x^2+y^2)\,dx\,dy$ by changing in to polar co-ordinates.

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

[5+5]

OR

7.a) By change of order of integration evaluate $\int\limits_{0}^{1}\int\limits_{0}^{\sqrt{1-x^2}}y^2\,dy\,dx$

b) Evaluate $\int\limits_{0}^{1}\int\limits_{0}^{\sqrt{1-x^2}}\int\limits_{0}^{\sqrt{1-x^2-y^2}}\dfrac{dx\,dy\,dz}{\sqrt{1-x^2-y^2-z^2}}$

[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 $\bar{F}=2xy\sin zi+x^2\sin zj+x^2y\cos zk$ is irrotational and find its scalar potential.

[5+5]

10.a) Evaluate $\iiint\limits_{V}f(x,y,z)\,dx\,dy\,dz$ 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 $\iint\limits_{S}x^2\,dy\,dz+x^2y\,dx\,dz+x^2z\,dx\,dy$ 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 $\oint\limits_{c}(f\nabla g).dr=\int\limits_{s}(\nabla f\times\nabla f).\bar{n}\,ds$ using stoke's theorem.

[5+5]

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