Code No: 152AA **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year II Semester Examinations, May - 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) Solve $y = a\sqrt{1+p^2}$. [2]

b) Solve $\frac{1}{D^2}x^4$. [2]

c) Evaluate $\int_{x=1}^{3}\int_{y=0}^{1} xy^2\,dydx$. [2]

d) If $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ then evaluate $\nabla^2(r^2)$. [2]

e) Find the value of $\int_V (\vec{i} + \vec{j} + \vec{k})dV$. [2]

f) Find the integrating factor of $\frac{dy}{dx} + 2xy = e^{-x^2}$. [3]

g) Solve $(D^3 - 4D^2)y = 5$. [3]

h) Find the limits after changing the order of integration for $\int_0^b \int_0^{a/b\sqrt{b^2-y^2}} f(xy)\,dydx$. [3]

i) Find a unit vector normal to the surface $x^3 + y^3 + 3xyz = 3$. [3]

j) If $\vec{F}(t) = x\vec{i} + 2y\vec{j} + z\vec{k}$ then evaluate $\int_1^2 curl\,\vec{F}(t)\,dt$. [3]

PART-B

(50 Marks)

2.a) Solve $(1+x^2)\frac{dy}{dx} + 2xy = 4x^2, y(0) = 0$.

b) If 30% of a radioactive substance disappears in 10 days, how long will it take for 90% of it to disappear? [5+5]

OR

3.a) Solve $(y + y^2)dx + xy\,dy = 0$.

b) Solve $(x + 2y^3)\frac{dy}{dx} = y$. [5+5]

4.a) Solve $(D^2 + 4)y = \tan 2x$ by variation of parameters.

b) Solve $(D^3 + 4D)y = 5 + \sin 2x$. [5+5]

OR

5.a) Solve $(D^2 + 4D + 3)y = e^{e^x}$.

b) Solve $(D^2 + 1)y = x^2 \sin 2x$. [5+5]

6.a) Evaluate $\int_0^{\pi}\int_0^{a(1+\cos\theta)} r^2 \cos\theta \, dr \, d\theta$.

b) Evaluate $\int_0^{\log 2}\int_0^{x}\int_0^{x+\log y} e^{x+y+z} \, dz dy dx$. [5+5]

OR

7.a) Change into polar co-ordinates and evaluate $\int_0^{\infty}\int_0^{\infty} e^{-(x^2+y^2)} \, dy \, dx$.

b) Show that the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is $\frac{16}{3}a^2$. [5+5]

8.a) Find the angle between the normal to the surface $xy = z^2$ at the points (4, 1, 2) and (3, 3, -3).

b) Prove that $\nabla . (\vec{A} \times \vec{B}) = \vec{B}.(\nabla \times \vec{A}) - \vec{A}.(\nabla \times \vec{B})$. [5+5]

OR

9.a) Find the angle of intersection of the spheres $x^2 + y^2 + z^2 = 39$ and $x^2 + y^2 + z^2 + 4x - 6y - 8z + 52 = 0$ at the point (4, -3, 2).

b) A vector field is given by $\vec{A} = (x^2 + xy^2)\vec{\imath} + (y^2 + x^2 y)\vec{\jmath}$. Show that the field is irrotational and find the scalar potential. [5+5]

10. Find the work done in moving a particle in the force field $\vec{F} = 3x^2\vec{\imath} + (2xz - y)\vec{\jmath} + z\vec{k}$ along the straight line from (0, 0, 0) to (2, 1, 3). [10]

OR

11.a) Evaluate $\iint_S \bar{F}.\bar{n} ds$ if $\bar{F} = 2xy\bar{\imath} + yz^2\bar{\jmath} + xz\bar{k}$ over the parallelepiped x = 0, y = 0, z = 0, x = 2, y = 1, z = 3.

b) If $\bar{F} = (3x^2 - 2z)\bar{\imath} - 4xy\bar{\jmath} - 5x\bar{k}$, Evaluate $\int_v curl\, \bar{F} dv$, where v is volume bounded by planes x = 0, y = 0, z = 0 and 3x + 2y – 3z = 6. [5+5]

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