

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 $\int_{x=1}^3 \int_{y=0}^1 xy^2 dy dx$. [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 $\int_0^b \int_0^{a/b\sqrt{b^2-y^2}} f(xy) dy dx$. [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 $\int_1^2 \text{curl } \vec{F}(t) dt$. [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 $\nabla \cdot (\vec{A} \times \vec{B}) = \vec{B} \cdot (\nabla \times \vec{A}) - \vec{A} \cdot (\nabla \times \vec{B})$. [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 $\vec{A} = (x^2 + xy^2)\vec{i} + (y^2 + x^2y)\vec{j}$. 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 $\vec{F} = 3x^2\vec{i} + (2xz - y)\vec{j} + z\vec{k}$ along the straight line from (0, 0, 0) to (2, 1, 3). [10]
- OR**
- 11.a) Evaluate $\iint_S \vec{F} \cdot \hat{n} \, ds$ if $\vec{F} = 2xy\vec{i} + yz^2\vec{j} + xz\vec{k}$ over the parallelepiped $x = 0, y = 0, z = 0, x = 2, y = 1, z = 3$.
- b) If $\vec{F} = (3x^2 - 2z)\vec{i} - 4xy\vec{j} - 5x\vec{k}$, Evaluate $\int_v \text{curl } \vec{F} \, dv$, where v is volume bounded by planes $x = 0, y = 0, z = 0$ and $3x + 2y - 3z = 6$. [5+5]

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