R18

Code No: 152AA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech I Year II Semester Examinations, February - 2025
MATHEMATICS-II
(Common to CSE, IT, CSIT, ITE, CE(SE), CSE(CS), CSE(DS), CSE(N), CSD)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a) Find the integrating factor of the differential equation $xy' + 2y = xe^{x^3}$. [2]

b) State newton's law of cooling and write the general solution of the differential equation. [3]

c) Evaluate $\frac{e^x}{D^2 - 3D + 2}$. [2]

d) Solve the differential equation $(D^2 - 4D + 4)y = 0$. [3]

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

f) Change $\int_0^a \int_0^{\sqrt{a^2-x^2}} xdxdy$ into polar coordinates. [3]

g) Find $\nabla x^2 yz^3$. [2]

h) Find Curl $\overline{F}$ and div $\overline{F}$, If $\overline{F} = (x^2 y\bar{i} + y\bar{j} - z\bar{k})$. [3]

i) State Divergence theorem. [2]

j) If $\bar{F} = x^2\bar{i} - xy\bar{j}$ and c is the St. line joining the points $(0,0)$ and $(1,1)$ then evaluate $\int_c \bar{F} \cdot d\bar{r}$. [3]

PART-B

(50 Marks)

2.a) Solve the differential equation $(1+x^2)(xdy + ydx) = -2yx^2 dx$.

b) Bacteria in a culture grows exponentially so that the initial number has doubled in 3 hours. How many times, the initial number will be present after 9 hours. [5+5]

OR

3.a) A bacterial culture growing exponentially, increases from 100 to 400grams in 10 hours. How much was present after 3 hours.

b) Solve the differential equation $(x^2 - 4xy - 2y^2)dx + (y^2 - 4xy - 2x^2)dy = 0$. [5+5]

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

b) Solve the differential equation $(D^2+2)y=e^x\cos x$. [5+5]

OR

5. Solve by the method of variation of parameters $\frac{d^2y}{dx^2}+4y=\tan 2x$. [10]

6. Evaluate $\int_0^1\int_0^{1-x}\int_0^{1-x-y}(xyz)\,dx\,dy\,dz$. [10]

OR

7.a) Evaluate $\int_0^{\pi/2}\int_0^{a\cos\theta} r^4\,d\theta dr$.

b) Evaluate $\int_0^a\int_0^{\sqrt{a^2-y^2}}\left(x^2+y^2\right)dxdy$ by changing into polar coordinates. [5+5]

8. Prove that the vector field $\bar{F}=(x^2+xy^2)\bar{i}+\left(y^2+x^2y\right)\bar{j}$ is conservative and find the scalar potential. [10]

OR

9.a) Show that $\nabla^2 r^n=n(n+1)r^{n-2}$.

b) Find the directional derivative of f(x,y,z) = xy^2+yz^3 at the point (2,-1,1) in the direction of the vector i+2j+2k. [5+5]

10. Use Stoke's Theorem to evaluate $\int_c(x+y)dx+(2x-z)dy+(y+z)dz$ where C is the boundary of the triangle with vertices (2,0,0), (0,3,0) and (0,0,6). [10]

OR

11. Verify Green's theorem for $\int_c\left(xy+y^2\right)dx+x^2dy$ where c is bounded by $y=x$ *and* $y=x^2$. [10]

--ooOoo--