

**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  $\int_0^a \int_0^{\sqrt{a^2-x^2}} xdx dy$  into polar coordinates. [3]
- g) Find  $\nabla x^2 yz^3$ . [2]
- h) Find Curl  $\vec{F}$  and div  $\vec{F}$ , If  $\vec{F} = (x^2 y\vec{i} + y\vec{j} - z\vec{k})$ . [3]
- i) State Divergence theorem. [2]
- j) If  $\vec{F} = x^2\vec{i} - xy\vec{j}$  and  $c$  is the St. line joining the points (0,0) and (1,1) then evaluate  $\int_c \vec{F} \cdot d\vec{r}$ . [3]

**PART-B**

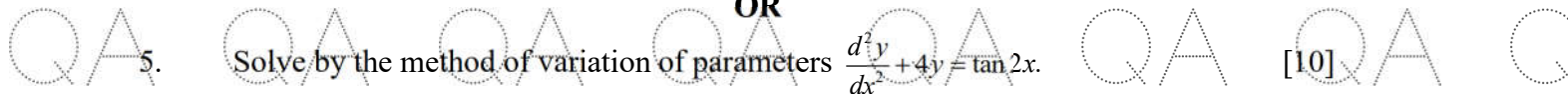
**(50 Marks)**

- 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  $\int_0^{\pi/2} \int_0^{a \cos \theta} r^4 dr d\theta$ .  
b) Evaluate  $\int_0^a \int_0^{\sqrt{a^2 - y^2}} (x^2 + y^2) dx dy$  by changing into polar coordinates. [5+5]

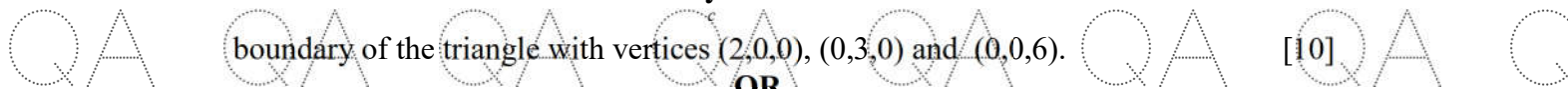
8. Prove that the vector field  $\vec{F} = (x^2 + xy^2)\vec{i} + (y^2 + x^2y)\vec{j}$  is conservative and find the scalar potential. [10]



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  $\int (x+y)dx + (2x-z)dy + (y+z)dz$  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  $\int_c (xy + y^2) dx + x^2 dy$  where  $c$  is bounded by  $y = x$  and  $y = x^2$ . [10]

