Code No: 152AA **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year II Semester Examinations, November/December - 2020
MATHEMATICS-II
(Common to CE, EEE, ME, ECE, EIE, MCT, MMT, AE, MIE, PTM)

Time: 2 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) Solve $\frac{dy}{dx} + \frac{y}{x} = y^2 x \sin x$.

b) If the air is maintained at 30^0C and the temperature of the body cools from 80^0C to 60^0C in 12 minutes, find the temperature of the body after 24 minutes. [7+8]

2.a) Solve $\frac{dy}{dx} = e^{x-y}(e^x - e^y)$.

b) Radium decomposes at a rate proportional to the amount present. If p% of the original amount disappears in 1 year, how much will remain at the end of 21 years. [7+8]

3.a) Solve $\frac{d^2y}{dx^2} - (a+b)\frac{dy}{dx} + aby = e^{ax} + e^{bx}$.

b) Solve $(D^2 - 1)y = e^x \cos x$. [8+7]

4.a) Solve $(D^2 - 4D + 3)y = \sin 3x \cos 2x$.

b) Solve $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 2\log x$. [7+8]

5.a) Check the equality of the two double integrals

$$\int_0^1\left(\int_0^1 \frac{x-y}{(x+y)^3}dy\right)dx \text{ and } \int_0^1\left(\int_0^1 \frac{x-y}{(x+y)^3}dx\right)dy.$$

b) Evaluate $\int_0^1\int_0^{\sqrt{1-x^2}}\int_0^{\sqrt{1-x^2-y^2}} dxdydz$. [8+7]

6.a) Change the order of integration in the integral and evaluate $\int_0^{4a}\int_{x^2}^{2\sqrt{ax}} dydx$.

b) Calculate the volume of the solid bounded by the planes x = 0, y = 0, x+y+z = a and z = 0. [7+8]

7. Find the directional derivative of the function $\varphi = xy^2 + yz^3$ at the point (2, -1, 1) in the direction of the normal to the surface $x\log z - y^2 + 4 = 0$ at (-1, 2, 1). [15]

8. Verify Green's theorem in the plane for $\int_C (x^2 - xy^3)\,dx + (y^2 - 2xy)\,dy$ where C is a square with vertices (0, 0) (2, 0) (2, 2) (0, 2). [15]

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