R18

Code No: 152AA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year II Semester Examinations, September/October - 2021
MATHEMATICS-II
(Common to EEE, CSE, IT, CSIT, ITE, CE(SE), CSE(CS), CSE(DS), CSE(Networks))

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

Answer any five questions
All questions carry equal marks
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1.a) Solve the differential equation $(cosx + ysinx)dx - cosxdy = 0$.
b) If air is maintained at 20^0C and temperature of the body cools from 80^0C to 60^0C in 10 minutes. Find the temperature of the body after 30 minutes. [7+8]

2.a) Solve the differential equation $2xydy - (x^2 - y^2 + 1)dx = 0$.
b) Bacteria in a culture grows exponentially so that the initial number has doubled in three hours. How many times the initial number will be present after 9 hours? [7+8]

3.a) Solve the differential equation $(D^2 + 2D + 1)y = e^x sinx$.
b) Solve the differential equation $(D^2 + 1)y = sin2x$ using method of Variation of parameters. [7+8]

4.a) Solve the differential equation $(D^2 + 1)y = xcosx$.
b) Solve the differential equation $(D^2 + 4D + 4)y = x^2e^{-2x}$. [7+8]

5.a) Evaluate $\int\int_R (x^2 + y^2)\,dx\,dy$ where R is the region bounded by $x = 0$, $y = 0$, $x + y = 1$ in first quadrant.
b) Evaluate $\int_0^{2a} \int_{-\sqrt{2ax - x^2}}^{\sqrt{2ax - x^2}} \int_{z=0}^{\sqrt{4a^2 - x^2 - y^2}} z\,dz\,dy\,dx$ by change into polar co-ordinates. [8+7]

6.a) Evaluate $\int_{\pi/2}^{a} \int_{a(1+\cos\theta)}^{a} r\,dr\,d\theta$.
b) Evaluate $\iiint (x^2 + y^2 + z^2)\,dx\,dy\,dz$ taken over the volume enclosed by the sphere $x^2 + y^2 + z^2 = 1$ by transforming into spherical co-ordinates. [7+8]

7.a) Prove that $\nabla^2(r^n) = n(n+1)r^{n-2}$.
b) Prove that $r^n\bar{r}$ is solenoidal if $n = -3$. [7+8]

8. Evaluate $\int_S \bar{F}.\bar{n}\,ds$ where $\bar{F} = z\bar{i} + x\bar{j} - 3y^2z\,\bar{k}$ and s is the surface $x^2 + y^2 = 16$ included in the first octant between z = 0 and z = 5. [15]

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