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CODE: 16BS1001 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech I Semester Supplementary Examinations, January-2019

ENGINEERING MATHEMATICS – I

(Common to all Branches)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Solve $1+(x\tan y-\sec y)\frac{dy}{dx}=0$ 7M

   b) Find the solution of $x\sin x\,dy+(y(x\cos x-\sin x)-2)dx=0$ 7M

(OR)

2. a) Find the orthogonal trajectories of the family of curves $r=2a(\cos\theta+\sin\theta)$ 7M

   b) A body kept in air with temperature 25^0c cools down from 145^0c to 80^0c in 20min. Find when the body cools down to 35^0c 7M

UNIT-II

3. a) Solve $(D^2-D)y=2x-1-3e^x$ 7M

   b) Solve $\frac{d^2y}{dx^2}+9y=\tan 3x$ 7M

(OR)

4. a) Solve $y''-2y'+y=e^x\log x$ by using variation of parameters 7M

   b) Solve $(D^2+5D+4)y=x^2+7x+9$ 7M

UNIT-III

5. a) If $u=f(r)$ and $x=r\cos\theta, y=r\sin\theta$ prove that $\frac{\partial^2u}{\partial x^2}+\frac{\partial^2u}{\partial y^2}=f''(r)+\frac{1}{r}f'(r)$ 7M

   b) Expand e^{xy} in the neighbourhood of (1,1) 7M

(OR)

6. a) Find the shortest distance from origin to the surface $xyz^2 = 2$ 7M
   b) Show that $u = \frac{x^2-y^2}{x^2+y^2}, v = \frac{2xy}{x^2+y^2}$ are functionally dependent and find the relation 7M

UNIT-IV

7. a) Evaluate $\iint (x^2 + y^2) dxdy$ over the area bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ 7M
   b) Evaluate $\iiint (2x + y) dxdydz$ where V is the closed region bounded by the cylinder $z = 4 - x^2$ *and the planes* $x = 0, y = 2, z = 0$ 7M

(OR)

8. a) Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} (x^2y + y^2) dx\, dy$ by change into polar coordinates 7M
   b) Find the area which is inside the circle $r = sin\theta$ and out side the cardioids $r = (1 - cos\theta)$. 7M

UNIT-V

9. a) Find the directional derivative of $\frac{1}{r}$ in the direction of $\bar{r}$ at (1,1,2) 7M
   b) Prove that Curl $(\overline{A}\ X\ \overline{B}) - \bar{A} div \bar{B} - \bar{B} div \overline{A} + (\bar{B}.\nabla)\bar{A} - (\bar{A}.\nabla)\bar{B}$ 7M

(OR)

10. Verify the Gauss divergence theorem for $\bar{F} = (4x)\bar{i} - 2y^2\bar{j} + z^2\,\bar{k}$ taken over the region bounded by cylinder $x^2 + y^2 = 4; z = 0, z = 3$ 14M

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CODE: 13BS1001 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech I Semester Supplementary Examinations, January-2019

ENGINEERING MATHEMATICS - I
(Common to All Branches)

Time: 3 Hours **Max Marks: 70**

PART-A

ANSWER ALL QUESTIONS **[1 x 10 = 10 M]**

1. a) Solve $(x^2-ay)dx=(ax-y^2)dy$.
   b) State Newton's law of cooling.
   c) Solve $y^{11}-2y^1+10y=0$.
   d) Find the particular integral of $(D^2-6D+9)y=e^{-2x}$.
   e) If $x=r\cos\theta$, $y=r\sin\theta$ find $\frac{\partial(x,y)}{\partial(r,\theta)}$.
   f) Define stationary points.
   g) Evaluate $\int_1^2\int_1^3 xy^2\,dxdy$.
   h) Change the order of integration in $\int_0^a\int_y^a \frac{xdxdy}{x^2+y^2}$.
   i) If $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}, find \nabla.\bar{r}$
   j) State Gauss divergence theorem.

PART-B

Answer one question from each unit **[5x12=60M]**

UNIT-I

2. a) Solve $xy(1+xy^2)dy/dx = 1$. 6M
   b) Solve $\frac{dy}{dx}=\frac{x^3+y^3}{xy^2}$. 6M

(OR)

3. a) If the temperature of the air is 30^0C and the substance cools from 100^0Cto 70^0C in 15 minutes, find when the temperature will be 40^0C? 6M
   b) Find the orthogonal trajectories of the family of parabolas $y^2=4ax$. 6M

UNIT-II

4. a) Solve $(D^2-4D+3)y=\sin 3x \cos 2x$. 6M

b) Solve $(D^2+5D+6)y=e^{-2x}\sin 2x$. 6M

(OR)

5. a) Solve $(D^2+1)(D-1)y=0$. 6M

b) Solve $\frac{d^3y}{dx^3}+4\frac{dy}{dx}=\sin 2x$. 6M

UNIT-III

6. a) If $u=x+3y^2-z^3, v=4x^2yz, w=2z^2-xy$, evaluate $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ 6M

b) Expand $f(x,y)=x^y$ in powers of $(x-1)$ and $(y-1)$. 6M

(OR)

7. Examine the function $f(x,y)=x^4+y^4-2x^2+4xy-2y^2$ for extreme values. 12M

UNIT-IV

8. Change the order of integration in $I=\int_0^1\int_{x^2}^{2-x} xy\,dx\,dy$ and hence evaluate the same. 12M

(OR)

9. a) Calculate $\iint r^3\,dr\,d\theta$ over the area included between the circles $r=2\sin\theta$ and $r=4\sin\theta$. 6M

b) Evaluate $\int_0^\infty\int_0^\infty e^{-(x^2+y^2)}\,dx\,dy$ by changing into polar coordinates. 6M

UNIT-V

10. a) Find the angle between the surfaces $x^2+y^2+z^2=9$ and $z=x^2+y^2-3$ at the point (2,-1,2). 6M

b) If $\overline{A}=(3x^2+6y)\overline{i}-14yz\overline{j}+20xz^2\overline{k}$, evaluate $\int \overline{A}.d\overline{r}$ from (0,0,0)to(1,1,1) along the path $x=t, y=t^2, z=t^3$. 6M

(OR)

11. Verify Green's theorem for $\int_c\left[(xy+y^2)dx+x^2dy\right]$, where c is bounded by $y=x$ and $y=x^2$. 12M

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