AR16

CODE: 16BS1001 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech I Semester Supplementary Examinations, February-2018

ENGINEERING MATHEMATICS – I

(Common to CE, EEE, ME. ECE, CSE & IT Branches)

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

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT-I

1. a) Solve $2xy' = 10x^3y^5 + y.$ 7M

   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. 7M

(OR)

2. a) Solve $(y\log y)\,dx + (x - \log y)\,dy = 0.$ 7M

   b) Find the orthogonal trajectories of the family of cardioids $r = a(1+\cos\theta).$ 7M

UNIT-II

3. Solve $(D^3 + 2D^2 + D)y = \sin x + e^{2x}.$ 14M

(OR)

4. a) Solve $\frac{d^4y}{dx^4} - y = e^x \cos x.$ 7M

   b) Solve by the method of variation of parameters $y'' - 6y' + 9y = \frac{e^{3x}}{x^2}.$ 7M

UNIT-III

5. a) If $u = x\sqrt{1-y^2} + y\sqrt{1-x^2}$, $v = \sin^{-1}x + \sin^{-1}y$, show that u, v are functionally related and find the relationship. 7M

   b) Expand $f(x,y) = \tan^{-1}(y/x)$ in powers of $(x-1)$ and $(y-1)$ up to third-degree terms. 7M

(OR)

6. Examine the function $2(x^2 - y^2) - x^4 + y^4$ for its extreme values. 14M

UNIT-IV

7. a) Evaluate $\iint xy\, dxdy$ over the triangle bounded by $x = 0,\ y = 0$ and $x + y = 1.$ 7M

   b) Evaluate $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x+y+z)\, dydxdz$. 7M

(OR)

8. a) Evaluate $\iint r^2 \sin\theta\, drd\theta$, over the semicircle $r = 2a\cos\theta$ above the initial line. 7M

   b) Change the order of integration and hence evaluate $\int_{0}^{\infty}\int_{x}^{\infty}\frac{e^{-y}}{y}dydx$. 7M

UNIT-V

9. a) Find the values of `a' and `b' such that the surfaces $ax^2 - byz = (a+2)x$ and $4x^2y + z^3 = 4$ cut orthogonally at $(1,-1,2)$. 7M

   b) Show that $\nabla^2 f(r) = f''(r) + \frac{2}{r}f'(r)$, where $r = |\bar{r}|$. 7M

(OR)

10. Verify Green's theorem for $\int_C (3x - 8y^2)\, dx + (4y - 6xy)\, dy,$ where C is the boundary of the triangle bounded by $x = 0,\ y = 0$ and $x + y = 1.$ 14M

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AR13

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ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech I Semester Supplementary Examinations, February-2018

ENGINEERING MATHEMATICS – I

(Common to All Branches)

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

PART-A

Answer all Questions **[10 x 1 = 10 M]**

1. (a) Compute the integrating factor of the linear differential equation $\frac{dx}{dy}+\frac{x}{y\log y}=\frac{1}{y}$

   (b) Define orthogonal trajectories of a family of curves

   (c) Compute the particular integral of $(D^2+1)y=x^4$

   (d) Find the complementary function of $(D^2+D+1)y=\sin 2x$

   (e) Define Jacobian of two functions

   (f) What are the necessary conditions for $f(x,y)$ to have a maximum or minimum at a point (a,b)

   (g) Evaluate $\int_1^2\int_1^3 xy^2\,dxdy$

   (h) Write the formula for the length of the arc of the curve $y=f(x)$ between $x=a$ and $x=b$

   (i) Find $div\,\overline{F}$ if $\overline{F}=xyz\,\bar{i}+3x^2y\,\bar{j}+\left(xz^2-y^2z\right)\bar{k}$ at a point $(2,-1,1)$

   (j) Find normal to the surface $xy^3z^2=4$ at (-1,-1, 2)

PART-B:

Answer one question from each unit **[5 x 12=60M]**

UNIT-I

2. (a) Solve $\frac{dy}{dx}+x\sin 2y=x^3\cos^2 y$

   (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

(OR)

3. (a) Solve $(x^2y-2xy^2)dx-(x^3-3x^2y)dy=0$

   (b) Show that the family of confocal parabolas $y^2=4a(x+a)$ where 'a' is a parameter, is self orthogonal

UNIT-II

4. (a) Solve $(D^2-2D+1)y=xe^x\sin x$

   (b) Solve $(D^2-4D)y=x\sinh x$

(OR)

5. (a) Using the method of variation parameters, solve $(D^2+1)y=\cos ec(x)$

   (b) Solve $(D^2-6D+8)y=e^{2x}$

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UNIT-III

6. (a) Expand $\tan^{-1}\left(\frac{y}{x}\right)$ in the powers of $(x-1)$ and $(y-1)$ up to second degree terms

   (b) If $x = r\sin\theta\cos\phi, y = r\sin\theta\sin\phi, z = r\cos\theta$ then find $\frac{\partial(x,y,z)}{\partial(r,\theta,\phi)}$

(OR)

7. (a) Using the Taylor's Theorem express the polynomial $2x^3 + 7x^2 + x + 6$ in powers of $x - 2$
   (b) Discuss the Maxima & Minima of $U = \sin x \sin y \sin(x+y)$

UNIT-IV

8. (a) Find the perimeter of the curve $3ay^2 = x(x-a)^2$

   (b) Evaluate $\int_0^1\int_0^1 \frac{dx\,dy}{\sqrt{(1-x^2)(1-y^2)}}$

(OR)

9. (a) Evaluate $\int_0^{4a}\int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dy\,dx$ by changing the order of the integration

   (b) Evaluate $\iint_R e^{2x+3y}\,dxdy$ over the triangle bounded by $x = 0, y=0$ *and* $x + y=1$

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 $(2,-1,2)$

    (b) If $\vec{f} = 3xy\vec{i} - y^2\vec{j}$, evaluate $\int_C \vec{f}.d\vec{r}$, where C is the curve in the $xy-$plane $y = x^2$ from $(0,0)$ to $(1,2)$

(OR)

11. (a) If $(x+2y+az)\vec{i} + (bx-3y-z)\vec{j} + (4x+cy+2z)\vec{k}$ is irrotational, find the constants a,b,c

    (b) Evaluate $\oint_C [(xy+y^2)dx + x^2dy]$, where C is bounded by $y = x$ and $y = x^2$

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