AR16

CODE: 16BS1001 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech I Semester Regular/Supplementary Examinations, December-2017

ENGINEERING MATHEMATICS – I

(Common to CE, EEE, ME, ECE, CSE & IT 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 $ydx - xdy + (1+x^2)dx + x^2 Sin\, y\, dy = 0$ 7M

   b A radio active substance disintegrates at a rate proportional to its mass , when its mass is 10mgm, the rate of disintegration is 0.051mgm per day. How long will it take for the mass to be reduced from 10mgm to 5 mgm. 7M

(OR)

2. a Solve $\frac{dy}{dx} + y\tan x = Cos^3 x$ 7M

   b Find the orthogonal trajectories of the family of Parabolas $y^2 = 4ax$ 7M

UNIT-II

3. a Solve $(D^3+1)y = 3+5e^x$ 7M

   b Solve $(D^3 - D^2 - 6D)y = 1+x^2$ 7M

(OR)

4. a Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 3y = e^x \cos 3x$ 7M

   b Solve $\frac{d^2y}{dx^2} + 4y = Sec2x$ by the method of variation of parameters. 7M

UNIT-III

5. a If $u = \tan^{-1}(\frac{2xy}{x^2 - y^2})$ *then prove that* $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ 7M

   b If $u = f(r,s,t)$ where $r = \frac{x}{y}$, $s = \frac{y}{z}$, $t = \frac{z}{x}$ 7M

   Then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$

(OR)

6. a If $u = \frac{x+y}{1-xy}$ and $\theta = \tan^{-1}(x) + \tan^{-1}(y)$ then find $\frac{\partial(u,\theta)}{\partial(x,y)}$. 7M

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

UNIT-IV

7. a Change the order of integration and evaluate $\int_0^1 \int_{x^2}^{2-x} xydydx$ 14M

(OR)

8. a Evaluate $\int_0^1 \int_0^{1-x} \int_0^{x+y} e^x dxdydz$ 7M

   b Evaluate $\iint_R ydxdy$, where R is the region bounded by the parabolas 7M
   $y^2 = 4x$ and $x^2 = 4y$

UNIT-V

9. a Verify Green's theorem in a plane for $\int_C (xy^2 - 2xy)dx + (x^2y + 3)dy$ around the boundary C of the region enclosed by $y^2 = 8x$ and $x = 2$ 14M

(OR)

10. a Verify Stokes theorem for $\bar{F} = xy\bar{i} + xy^2\bar{j}$ taken around the square bounded by the lines $x = \pm 1$ and $y = \pm 1$ 14M

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AR13

CODE: 13BS1001 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech I Semester Supplementary Examinations, December-2017
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) Find the integrating factor of the equation $(x^2y-2xy^2)dx-(x^3-3x^2y)dy=0$.
   b) Write Bernoulli's linear equation.
   c) Solve $\frac{d^2x}{dt^2}+5\frac{dx}{dt}+6x=0$.
   d) Find the particular integral(y_p) of $(D^3+4D)y=Sin2x$.
   e) If $z=u^2+v^2$ and $u=at^2, v=2at$ find dz/dt.
   f) Write the stationary points of $f(x,y)=xy+x-y$.
   g) Evaluate $\int_0^1\int_0^x e^y dydx$.
   h) Evaluate $\int_0^1\int_1^2\int_1^2 dxdydz$.
   i) Write the value of curl(gradf).
   j) State Green's theorem.

PART-B

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

UNIT-I

2. a) Solve $2y^1\cos x+4y\sin x=\sin 2x$. 6M
   b) Solve $\frac{dy}{dx}+y\tan x=Cos^3x$. 6M

(OR)

3. a) The number N of bacteria in a culture grew at a rate proportional to N. The value of N was initially 100 and increased to 332 in one hour. What would be the value of N after 1.5 hours? 6M
   b) Find the orthogonal trajectories of the cardioide $r=a(1-\cos\theta)$. 6M

UNIT-II

4. a) Solve $(D^3+1)y= \cos(2x)$. 6M

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

(OR)

5. a) Solvle $(D^2-2D+4)y= e^x$. 6M

   b) Solve by the method of variation of parameters 6M

   $\frac{d^2y}{dx^2}+4y=Tan2x$.

UNIT-III

6. a) If $u=Tan^{-1}(y/x)$ and $x=e^t-e^{-t}$, $y= e^t+e^{-t}$, find du/ dt. 6M

   b) If $u=\frac{x+y}{1-xy}, v=Tan^{-1}x+Tan^{-1}y, find\ \frac{\partial(u,v)}{\partial(x,y)}$ .Are u and v functionally related? 6M

(OR)

7. Discuss the maxima and minima of $f(x,y)=x^3y^2(1-x-y)$. 12M

UNIT-IV

8. Solve by changing the order of integration $\int_0^a\int_{x^2}^{2-x} xydydx$. 12M

(OR)

9. a) Evaluate $\iint\frac{rdrd\theta}{\sqrt{a^2+r^2}}$ over one loop of the lemniscate $r^2=a^2\cos2\theta$. 6M

   b) Evaluate $\int_0^1\int_0^{\sqrt{1-x^2}}\int_0^{\sqrt{1-x^2-y^2}} xyzdxdydz$. 6M

UNIT-V

10. a) Prove that $\nabla.(r^n\bar{r})=(n+3)r^n$. 6M

    b) Calculate $curl(curl\bar{A})\ if\ \bar{A}=x^2y\bar{i}+y^2z\bar{j}+z^2x\bar{k}$. 6M

(OR)

11. Verify Stoke's theorem for the vector field $\bar{F}=(2x-y)\bar{i}-yz^2\bar{j}-y^2z\bar{k}$ over the upper half of the sphere $x^2+y^2+z^2=1$ bounded by its projection on xy plane. 12M

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