AR18

CODE: 18BST102 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, July-2019

DIFFERENTIAL EQUATIONS AND TRANSFORM THEORY

(Common to EEE, ECE Branches)

Time: 3 Hours **Max Marks: 60**

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 $(1+y^2)dx+(x-e^{-\tan^{-1}y})dy=0$ 6 M

   b) Solve $(D^2+1)x=t\cos 2t$ 6 M

(OR)

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

   b) Solve $(D^2-3D+2)y=xe^{3x}+\sin 2x$ 6 M

UNIT-II

3. Expand $f(x)=x\,Sinx$ as a Fourier series in $0<x<2\pi$ 12 M

(OR)

4. Find the Fourier series expansion of $f(x)=2x-x^2$ in (0,3) and hence deduce that $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\ldots$ 12 M

UNIT-III

5. Find the Fourier transform of $f(x)=\begin{cases}1-x^2, |x|\le 1\\ 0, |x|>1\end{cases}$ Hence evaluate $\int_0^\infty \frac{x\,Cosx-Sinx}{x^3}Cos\frac{x}{2}dx$ 12M

(OR)

6. a) Find the Fourier transform of $f(x) = \begin{cases} 1, & |x| < 1 \\ 0, & |x| > 1 \end{cases}$ 12M

and hence find the value of $\int_0^\infty \frac{Sin\,t}{t} dt$

UNIT-IV

7. a) Find $L\left\{\frac{\cos 2t - \cos 3t}{t}\right\}$ 6M

b) Evaluate $L^{-1}\left\{\frac{s}{s^4+s^2+1}\right\}$

(OR)

8. Solve the differential equation 6 M

$y''(t) + 2y'(t) + 5y(t) = e^{-t} \sin t$ where $y(0) = 0, y'(0) = 1$

UNIT-V

9. a) If $Z[u_n] = \frac{z}{(z-2)(z+3)^2}$,find u_0, u_1, u_2, u_3 6M

b) Find $Z[n Cosn\theta]$ 6M

(OR)

10. a) Find $Z^{-1}\left[\frac{z}{z^2+11z+24}\right]$ 6M

b) Evaluate $Z^{-1}\left[\frac{z^2}{(z-2)(z-4)}\right]$,using convolution theorem 6M

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AR18

CODE: 18BST103 **SET 1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, July-2019

DIFFERENTIAL EQUATIONS

(Common to CE, ME, CSE, IT Branches)

Time: 3 Hours **Max Marks: 60**

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 $xy' - y = x^2$ **6M**

   b) A body is originally at 80^0C and cools down to 60^0C in 20 minutes. Find the temperature of the body at 40 minutes, if the temperature of the surrounding medium is 30^0C. **6M**

(OR)

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

   b) Find the orthogonal trajectories of the family $x^2 + 2y^2 = k^2$, where k^2 is a parameter. **6M**

UNIT-II

3. a) Solve: $y''' + 4y' = t,\ y(0) = 0,\ y'(0) = 0, y''(0) = 1.$ **6M**

   b) Solve: $y'' - 3y' + 2y = e^x \sin x.$ **6M**

(OR)

4. a) Solve: $y'' - 9y' + 18y = e^{-3x}$ **6M**

   b) Solve: $y'' + 4y = \sec 2x$ **6M**

UNIT-III

5. Express $3x^3 + 2x^2 + x + 1$ in terms of Legendre polynomials. **12M**

6. a) Find $P_n(1), P_n(-1), n \in \square$. **6M**

   b) Express $J_{-\frac{3}{2}}(x), J_{-\frac{5}{2}}(x)$ in terms of $\sin x, \cos x.$ **6M**

UNIT-IV

7. a) Form the partial differential equation by eliminating the arbitrary functions f, g from $z = y f(x) + x g(y)$. **6M**

   b) Solve $p + q = \sin x + \sin y$, where $p = \frac{\partial z}{\partial x}, q = \frac{\partial z}{\partial y}$ **6M**

(OR)

8. a) Form the partial differential equation by eliminating the arbitrary functions f, g from $z = f(x + at) + g(x - at)$ **6M**

   b) Solve $x^2 p^2 + y^2 q^2 = z^2$, where $p = \frac{\partial z}{\partial x}, q = \frac{\partial z}{\partial y}$ **6M**

(OR)

UNIT-V

9. Solve $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 6\frac{\partial^2 z}{\partial y^2} = \cos(2x + y)$. **12M**

(OR)

10. Solve $\frac{\partial^3 z}{\partial x^3} - 2\frac{\partial^3 z}{\partial x^2 \partial y} = 2e^{2x} + 3x^2 y$. **12M**

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AR16

CODE: 16BS1002 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, July-2019

ENGINEERING MATHEMATICS – II

(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 in one place only

UNIT-I

1. Using the Bisection method find an approximate root of the equation $x^3-4x-9=0$ in four stages. (14M)

(OR)

2. a) Prove that the usual notations $\Delta = \left(\frac{1}{2}\right)\delta^2 + \delta\sqrt{1+(\delta^2)/4}$. (7M)

b) Given the values

x	5	7	11	13	17
f(x)	150	392	1452	2366	5202

Evaluate f(9) by using Lagranges formula. (7M)

UNIT-II

3 a) Using Symson's 1/3rd rule to find $\int_0^{0.6} e^{-x^2}\ dx\ dy$ taking seven ordinates. (7M)

b) Given that

x	1.5	2.0	2.5	3.0	3.5	4.0
f(x)	3.375	7.000	13.625	24.000	38.815	59.000

Find the first and second derivatives of f(x) at x = 1.5. (7M)

(OR)

4. Find the value of y for x = 0.2 by Runga-Kutta method given that $\frac{dy}{dx} = \frac{y-x}{y+x}$, y(0)= 1 and h=0.2. (14M)

UNIT-III

5 a) Evaluate $L(e^{-3t}(cos4t + 3sin4t))$ (7M)

b) Evaluate ($t\, e^{-t}\sin(3t)$) . (7M)

(OR)

6 Using Laplace transform to solve $\frac{d^2x}{dt^2} - 4\frac{dx}{dt} + 8x = e^{2t}, y(0) = 0, y(0)^1 = 0$ (14M)

UNIT-IV

7. Obtain the Fourier series for the function f(x) = x^2 in $-\pi \le x \le \pi$ and Prove that $x^2 = \frac{\pi^2}{3} + 4\sum_{n=1}^{\infty}(-1)^n \frac{cosnx}{n^2}$, Hence, deduce that $\frac{\pi^2}{12} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2}$ (14M)

(OR)

8. Obtain the half range Fourier cosine series for the function f(x) given by (14M)

$$f(x) = \begin{cases} k\,x\,, 0 \le x \le l/2 \\ k\,(l-x)\,,\ l/2 \le x \le l \end{cases}$$

UNIT-V

9.a) Form the p.d.e by eliminating the arbitrary function z from z = f(x+y) . g(x-y). (7M)

b) Solve the equation (x^2 -y^2 – yz) p +(x^2 -y^2 – zx) q = z(x-y). (7M)

(OR)

10. Find the temperature u(x,t) in a homogeneous bar of heat conducting material of length L cm with ends kept at zero temperature and initial temperature given by dx(L-x)/ L^2 . (14M)

AR16

CODE: 16CE1001 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, July-2019

BUILDING MATERIALS AND CONSTRUCTION

(Civil Engineering)

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)	What are the qualities of Good Building stone? Discuss them.	6
	b)	Write short notes on:	8
		(i) Refractory Bricks (iii) Over-Burnt Bricks (ii) Ceiling Tiles (iv) Fire clay Bricks	
		(OR)	
2.	a)	Explain the physical properties of Building materials.	7
	b)	Describe the thermal and electrical properties of Ceramics.	7

UNIT-II

3.	a)	List out the constituents of plastics. Explain briefly.	8
	b)	What are the different types of mortars used for Engineering works?	6
		(OR)	
4.	a)	Describe the procedure of preparing good quality concrete.	7
	b)	Explain the specific uses of metals and Glass materials.	7

UNIT-III

5.	a)	What are the types of water proofing methods in construction?	7
	b)	Describe the stepped footing with a neat sketch.	7
		(OR)	
6.	a)	Differentiate between stone masonry and brick masonry.	10
	b)	List out different types of foundations with sketches.	4

UNIT-IV

7.	a)	Explain the following types of stairs: (i) Dog-legged stairs (ii) Open newel stairs (iii)Quarter turn stairs	8
	b)	Expain briefly about single joist timber flooring with sketch.	6
		(OR)	
8.	a)	List out the different types of Doors. Explain any four.	8
	b)	Define ventilation? Explain plenum system of ventilation.	6

UNIT-V

9.	a)	Classify different types of varnish and briefly describe them.	7
	b)	Explain types of pointing with neat sketches.	7
		(OR)	
10.	a)	List down different types of paints. Explain with sketches various defects in paints.	8
	b)	What is formwork? Explain the purpose of formwork.	6

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Code No: RA/16ME1003 **AR 16** SET-I

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

ENGINEERING MECHANICS (STATICS)
(MECHANICAL ENGINEERING BRANCH)

Time: 3 hours **Max Marks: 70**

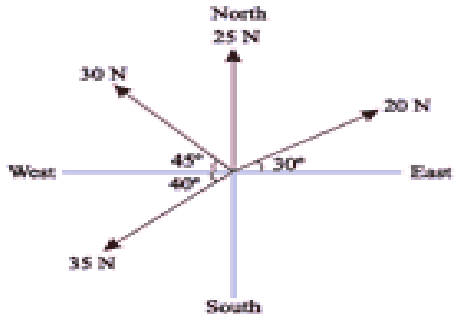
Answer ONE question from each unit
All questions carry equal marks
All parts of the Questions must be answered at one place

UNIT-I

1. **a)** Define parallelogram law of forces

   b) The following forces are act at a point as shown below (4M + 10 M)

   Find the magnitude and direction of the resultant force.



(OR)

2. Two cylinders of weights Q and R are interconnected by a bar of negligible weight hinged to each other at its geometric center by ideal pins. Determine magnitude of P applied at the centre of the cylinder R to keep the cylinders in equilibrium in the position shown in Fig1. The numerical data are given: Q=200 N and R= 1000 N.

14M

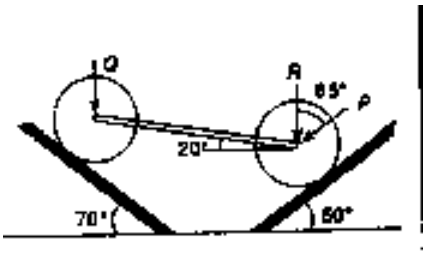


Fig.1

UNIT-II

3. a) State and prove theorem of Varignon. 4+10 M

b) Two smooth spheres P, Q each of radius 25 cm and weighting 500 N, rest in a horizontal channel having vertical walls as shown Fig.2. If the distance between the walls is 90 cm. Calculate the reactions at points of contact A ,B and C

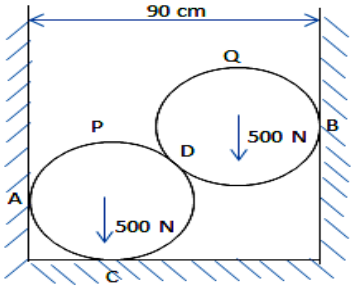


Fig.2

(OR)

4 a) Explain the following terms: 4 M

i) Friction ii) Angle of friction iii) Limiting friction iv) Cone of friction

b) A rigid bar is subjected to a system of parallel forces as shown in fig. Reduce this system to i) a single force ii) a single force- moment system at A iii) a single force- moment system at B. 10 M

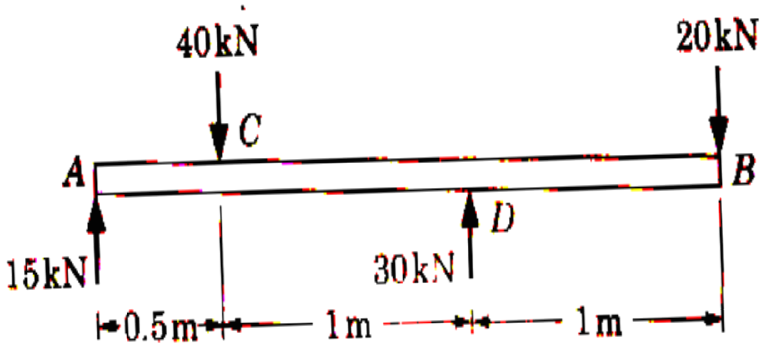


Fig.3

UNIT-III

5 a) State and explain theorems of Pappus. 4 M

b) Determine the coordinates of the centroid of the T-Section shown in Fig 4. 10M

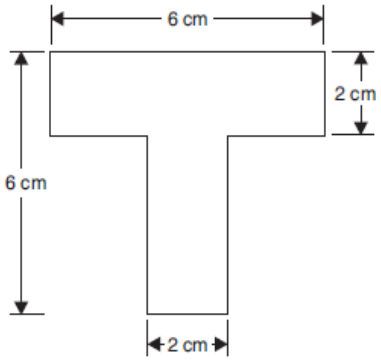


Fig.4

(OR)

6 a) Find the second moment of area of a square sides of length ***a*** with respect to a diagonal. 7M

7 b) Find the polar moment of inertia of an isosceles triangle having base ***b*** and height ***h*** with respect to its apex. 7M

UNIT-IV

7. Using method of joints, determine the forces in all the members of a truss shown in Fig 5. 14 M

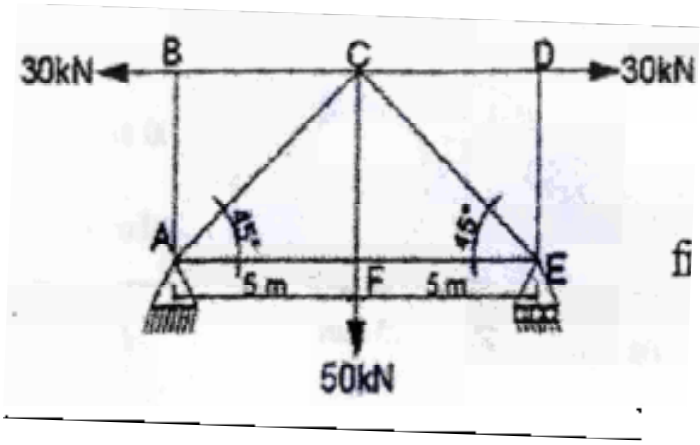


Fig 5

(OR)

8 a) State the assumptions made in the analysis of trusses 2M

b) Determine the axial forces in the bars 1, 2,3 of a truss shown in Fig 6. 12 M

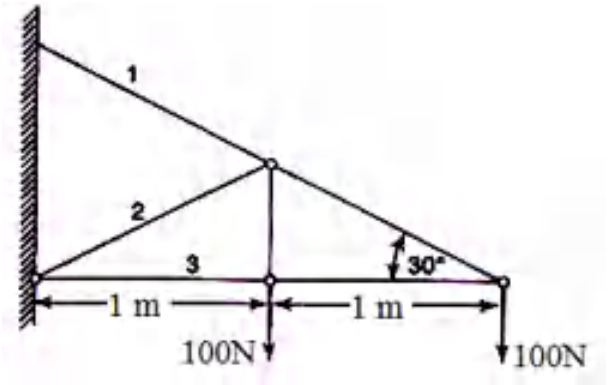


Fig 6.

UNIT-V

9 a) What is meant by Virtual work? 3 M

b) Using principle of virtual work, find the reactions at C and F of the assembly loaded as shown in Fig 7. 11 M

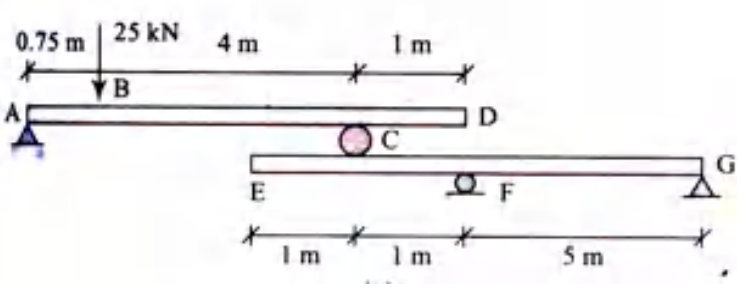


Fig 7

(OR)

10 a) Explain the terms fully constrained body and partially constrained body. 4 M

b) Using principle of virtual work, calculate the relation between the active forces P and Q for equilibrium of the system of bars shown in Fig 8. The bars are so arranged that they form three identical rhombuses. 10M

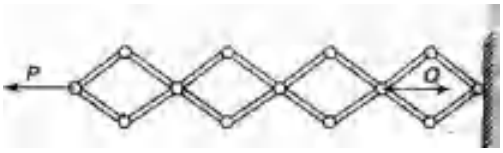


Fig 8

AR13 **Set-01**

Code: 13BS1003

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Supplementary Examinations, July-2019
ENGINEERING MATHEMATICS-III
(Common to all Branches)

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

PART-A

Answer all questions **[10x1M=10M]**

1. a) If two Eigen values of $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ are 3 and 15 then find the third Eigen value.
   b) What do you mean by trivial solution for the system $AX = 0$.
   c) Write the complex form of Fourier series.
   d) Write shifting property of Fourier transforms.
   e) State Fourier integral theorem.
   f) Find the *Z*-transform of unit impulse function.
   g) Write damping rule for *Z*-transforms.
   h) Find $Z[(n+1)^2]$.
   i) Find the value of $\Gamma\left(\frac{1}{4}\right)\Gamma\left(\frac{3}{4}\right)$.
   j) State the relation between Beta and Gamma functions.

PART-B

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

Unit-I

2. a) Find the rank of the matrix $A = \begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 1 \end{bmatrix}$ by reducing it to normal form.
   b) Test for consistency and solve $x + 2y + z = 3,\ 2x + 3y + 2z = 5,\ 3x - 5y + 5z = 2,\ 3x + 9y - z = 4.$ [6M+6M]

(OR)

3. Investigate for what values of λ and μ the following equations $2x + 3y + 5z = 9,\ 7x - 3y - 2z = 8,\ 2x + 3y + \lambda z = \mu,$ have (i) no solution (ii) a unique solution (iii) an infinite number of solutions. [12M]

Unit-II

4. a) Find the Eigen values and Eigen vectors of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$.

b) Reduce the quadratic form $2x_1x_2 + 2x_1x_3 - 2x_2x_3$ to a canonical form and write its nature. [6M+6M]

(OR)

5. Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and find A^{-1}. [12M]

Unit-III

6. Find the Fourier series for $f(x) = e^{-x}$ in the interval $0 < x < 2\pi$. [12M]

(OR)

7. Find the Fourier cosine transform of e^{-x^2}. $0 < x < 2$. [12M]

Unit-IV

8. a) Find the Z-transform of $n^2 e^{an}$

b) Using Z-transforms, solve: $u_{n+2} + 4u_{n+1} + 3u_n = 3^n$ with $u_0 = 0,\ u_1 = 1$. [6M+6M]

(OR)

9. a) Find $Z^{-1}\left[\dfrac{2z^2 + 3z}{(z+2)(z+4)}\right]$.

b) If $U(z) = \dfrac{2z^2 + 5z + 14}{(z-1)^4}$ then evaluate u_2 and u_3. [6M+6M]

Unit-V

10. a) Prove that $\beta(m,\ \frac{1}{2}) = 2^{2m-1}\beta(m,\ m)$.

b) Prove that $\int_0^1 \dfrac{x}{\sqrt{1-x^5}}\,dx = \dfrac{1}{5}\beta(\frac{2}{5},\ \frac{1}{2})$. [6M+6M]

(OR)

11. Prove that $\int_0^1 \dfrac{x^2}{\sqrt{1-x^4}}\,dx \times \int_0^1 \dfrac{dx}{\sqrt{1+x^4}} = \dfrac{\pi}{4\sqrt{2}}$. [12M]