Code No: R161203 **R16** SET - 1

I B. Tech II Semester Regular Examinations, April/May – 2017
MATHEMATICS-III
(Com. to CE, EEE, ME, ECE, CSE, CHEM, EIE, IT, ECC, AE, AME, MM, PE, PCE, MET, AGE)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Find the rank of a matrix $A = \begin{bmatrix} -1 & 2 & 1 & 8 \\ 2 & 1 & -1 & 0 \\ 3 & 2 & 1 & 7 \end{bmatrix}$ (2M)

b) Prove that if λ is an eigen value of a matrix A then λ^{-1} is an eigen value of the matrix A^{-1} if it exists. (2M)

c) Evaluate $\int_0^1 \int_0^1 \int_{\sqrt{x^2+y^2}}^{y} xyz\, dzdydx$. (2M)

d) Find the value of $\Gamma\left(\frac{5}{2}\right)$. (2M)

e) Find the angle between the surface $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at (2, -1, 2). (2M)

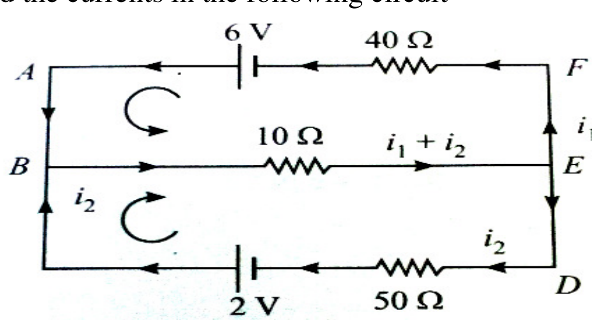
f) If $\bar{F} = (5xy - 6x^2)\bar{\imath} + (2y - 4x)\bar{\jmath}$ then evaluate $\int \bar{F}.\overline{dR}$ along the curve $y = x^3$ from the point (1, 1) to (2, 8). (2M)

g) Write the quadratic form corresponding to the symmetric matrix $\begin{bmatrix} 1 & 0 & 4 \\ 0 & -2 & -1 \\ 4 & -1 & 3 \end{bmatrix}$. (2M)

PART –B

2. a) Solve the system of equations $20x + y - 2z = 17, 3x + 20y - z = -18, 2x - 3y + 20z = 25$ by Gauss Jacobi method. (7M)

b) Find the currents in the following circuit (7M)



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3. a) Verify Cayley-Hamilton theorem and find the inverse of the matrix (7M)
$A = \begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$
b) Reduce the quadratic form $2x^2 + 2y^2 + 2z^2 - 2xy - 2yz - 2zx$ to canonical form by orthogonal transformation and hence find rank, index, signature and nature of the quadratic form. (7M)

4. a) Trace the curve $r^2 = a^2 cos2\theta$. (7M)
b) Evaluate $\int_0^a \int_{\frac{x^2}{a}}^{2a-x} x\, y^2 dydx$ by changing the order of integration. (7M)

5. a) Express $\int_0^1 x^m (1-x^n)^p\, dx$ in terms of Γ functions and hence evaluate $\int_0^1 x^5 (1-x^3)^{10}\, dx$. 6M)
b) Evaluate $\int_0^{\frac{\pi}{2}} sin^5\theta\; cos^7\theta \;\; d\theta$ by using β, Γ functions. (4M)
c) Express $\int_0^4 \sqrt{x}(4-x)^{3/2}\, dx$ in terms of β function. (4M)

6. a) Show that the vector field $\bar{F} = (x^2 - yz)\bar{\imath} + (y^2 - zx)\bar{\jmath} + (z^2 - xy)\,\bar{k}$ is conservative and find the scalar potential function corresponding to it. (7M)
b) Show that $\nabla.(\bar{F} \times \bar{G}) = \bar{G}.(\nabla \times \bar{F}) - \bar{F}.(\nabla \times \bar{G})$ (7M)

7. State Stoke's theorem and verify the theorem for $\bar{F} = (x+y)\bar{\imath} + (y+z)\bar{\jmath} - x\bar{k}$ and S is the surface of the plane $2x + y + z = 2$, which is in the first octant. (14M)

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Time: 3 hours Max. Marks: 70

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2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Determine the rank of a matrix $A = \begin{bmatrix} 2 & -1 & 3 & 4 \\ 0 & 3 & 4 & 1 \\ 2 & 3 & 7 & 5 \\ 2 & 5 & 11 & 6 \end{bmatrix}$. (2M)

b) Use Cayley-Hamilton theorem to find A^8 if $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$. (2M)

c) Evaluate $\int_0^1 \int_0^1 \int_0^y xyz\, dxdydz$. (2M)

d) Find the value of $\Gamma\left(-\frac{5}{2}\right)$. (2M)

e) Find unit normal vector to the surface $x^2y + 2xz^2 = 8$ at the point (1, 0, 2). (2M)

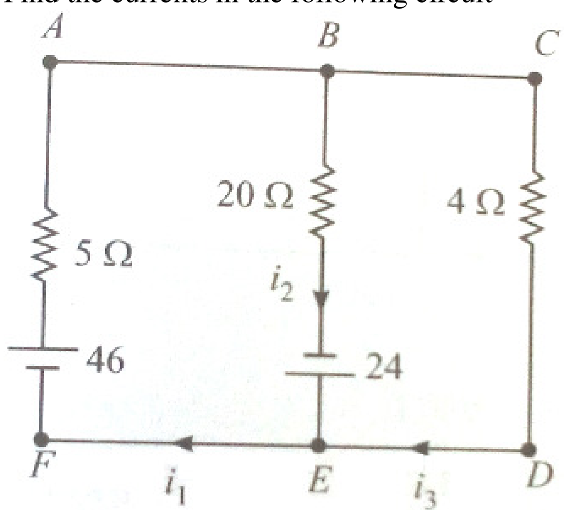
f) If $\bar{F} = (3x^2 + 6y)\bar{\imath} - 14yz\,\bar{\jmath} + 20xz\bar{k}$ then evaluate $\int \bar{F}.\overline{dR}$ from (0, 0, 0) to (1, 1, 1) along the path $x = t, y = t^2, z = t^3$. (2M)

g) Write the quadratic form corresponding to the symmetric matrix
$\begin{bmatrix} 0 & 5/2 & 3 \\ 5/2 & 7 & 1 \\ 3 & 1 & 2 \end{bmatrix}$ (2M)

PART –B

2. a) Show that the system of equations is consistent (7M)
$2x - y - z = 2, x + 2y + z = 2, 4x - 7y - 5z = 2$ and solve.

b) Find the currents in the following circuit (7M)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3\. a) Reduce the quadratic form $6x_1^2 + 3x_2^2 + 3x_3^2 - 4x_1x_2 - 2x_2x_3 + 4x_1x_3$ to canonical form and hence state nature, rank, index and signature of the quadratic form. (7M)

b) Determine the natural frequencies and normal modes of a vibrating system for which mass $m = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$ and stiffness $k = \begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$. (7M)

4\. a) Trace the curve $y^2(2a - x) = x^3$. (7M)

b) Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\, dxdy$ by changing in to polar coordinates and hence deduce $\int_0^\infty e^{-x^2}\, dx = \frac{\sqrt{\pi}}{2}$. (7M)

5\. a) Show that $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. 6M)

b) Evaluate $\int_0^{\frac{\pi}{2}} sin^4\theta\, cos^2\theta\;\, d\theta$ by using β, Γ functions. (4M)

c) Express $\int_0^1 \frac{1}{(1-x^3)^{1/3}}\, dx$ in terms of β function. (4M)

6\. a) Show that the vector field $\bar{F} = (x^2 + xy^2)\bar{\imath} + (y^2 + x^2y)\,\bar{\jmath}$ is conservative and find the scalar potential function. (7M)

b) Show that $\nabla(\nabla.\bar{F}) = \nabla \times (\nabla \times \bar{F}) + \nabla^2\bar{F}$. (7M)

7\. State Greens theorem in plane and verify the theorem for $\oint_C\, [(y - sinx)dx + cosx\; dy]$, where C is the plane triangle formed by the lines $y = 0, x = \frac{\pi}{2}$, $y = \frac{2}{\pi}x$. (14M)

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Time: 3 hours Max. Marks: 70

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2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Determine the rank of a matrix $A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$. (2M)

b) Use Cayley-Hamilton theorem and find A^{-1} if $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$. (2M)

c) Evaluate $\int_0^{\frac{\pi}{2}} \int_0^{a sin\theta} \int_0^{\frac{(a^2-r^2)}{a}} r\, dzdr\, d\,\theta$. (2M)

d) Show that $\beta\left(\frac{1}{2},\frac{1}{2}\right) = \pi$. (2M)

e) Find directional derivative of $\phi = xy^2 + yz^2$ at the point (2,-1,1) in the direction of the vector $\bar{\imath} + 2\,\bar{\jmath} + 2\bar{k}$. (2M)

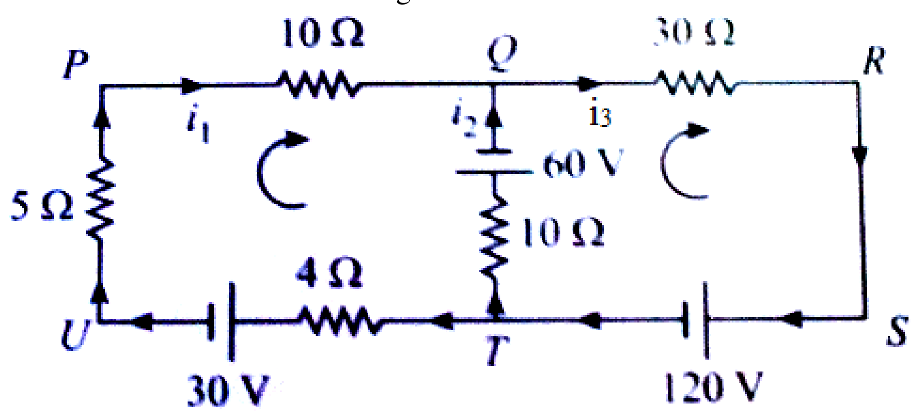
f) If $\bar{F} = (x^2 - y)\bar{\imath} + (2xz - y)\,\bar{\jmath} + z^2\bar{k}$ then evaluate $\int \bar{F}.\overline{dR}$ where C is the straight line joining the points (0, 0, 0) to (1, 2, 4). (2M)

g) Write the quadratic form corresponding to the symmetric matrix $\begin{bmatrix} 3 & 5 & 0 \\ 5 & 5 & 4 \\ 0 & 4 & 7 \end{bmatrix}$. (2M)

PART –B

2. a) Solve the system of equations $10x + y + z = 12,\ 2x + 10y + z = 13, 2x + 2y + 10z = 14$ by Gauss Seidel method. (7M)

b) Find the currents in the following circuit (7M)



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3. a) Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2xy - 2yz + 2zx$ to canonical form by orthogonal transformation and hence find the rank, index signature and nature of the quadratic form. (7M)

   b) Find the natural frequencies and normal modes of a vibrating system $mx'' + kx = 0$ for mass $m = \begin{bmatrix} 2 & 0 \\ 0 & 1 \end{bmatrix}$ and stiffness $k = \begin{bmatrix} 9 & -3 \\ -3 & 3 \end{bmatrix}$. (7M)

4. a) Trace the curve $a^2y^2 = x^2(a^2 - x^2)$. (7M)

   b) Evaluate $\int_0^1 \int_{\sqrt{y}}^{2-y} xy\,dxdy$ by changing the order of integration. (7M)

5. a) Show that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$. 6M)

   b) Evaluate $\int_0^{\frac{\pi}{2}} sin^5\theta\ d\theta$ by using β, Γ functions. (4M)

   c) Express $\int_0^1 \frac{x\,dx}{\sqrt{1+x^4}}$ in terms of β function. (4M)

6. a) Find the constants a, b such that the surfaces $5x^2 - 2yz - 9x = 0$ and $ax^2y + bz^3 = 4$ cut orthogonally at (1,-1,2). (7M)

   b) Show that $\nabla \times (\nabla \times \bar{F}) = \nabla(\nabla.\bar{F}) - \nabla^2\bar{F}$. (7M)

7. State Gauss divergence theorem in plane and verify the theorem for $\bar{F} = 4xz\bar{\imath} - y^2\bar{\jmath} + zy\bar{k}$ over the cube $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$. (14M)

Code No: R161203 **R16** SET - 4

I B. Tech II Semester Regular Examinations, April/May – 2017
MATHEMATICS-III
(Com. to CE, EEE, ME, ECE, CSE, CHEM, EIE, IT, ECC, AE, AME, MM, PE, PCE, MET, AGE)
Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Find inverse of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ by elementary operations. (2M)

b) Prove that if λ is an eigen value of a matrix A then $\frac{|A|}{\lambda}$ is an eigen value of adjA. (2M)

c) Evaluate $\int_0^1 \int_{y^2}^1 \int_0^{1-x} x\, dzdxdy$. (2M)

d) Determine the value of $\beta(2, 3)$. (2M)

e) Show that $\nabla fg = f\,\nabla g + g\,\nabla f$. (2M)

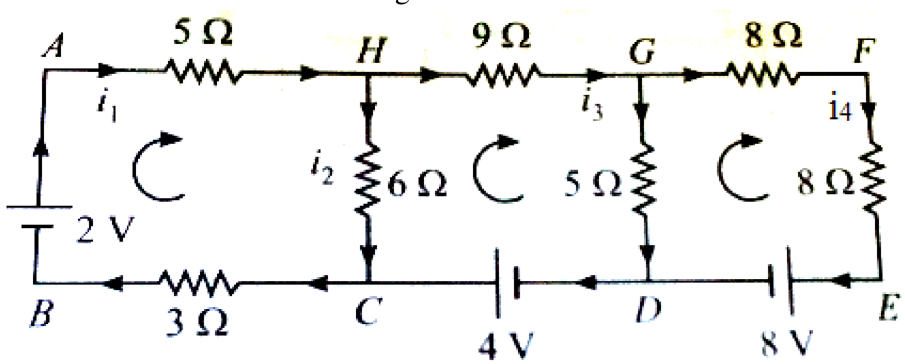
f) If $\bar{F} = x^2y^2\bar{\imath} + y\,\bar{\jmath}$ then evaluate $\int_C \bar{F}.\overline{dR}$ where C is the curve $y^2 = 4x$ in the XY plane from (0, 0) to (4, 4). (2M)

g) Write the quadratic form corresponding to the symmetric matrix (2M)
$\begin{bmatrix} 2 & -3 & 5 \\ -3 & 2 & -2 \\ 5 & -2 & 2 \end{bmatrix}$

PART –B

2. a) Solve the system of equations (7M)
$x + 10y + z = 6,\ 10x + y + z = 6, x + y + 10z = 6$ by Gauss Seidel method.

b) Find the currents in the following circuit (7M)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3. a) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ and hence find A^4 . (7M)

b) Reduce the quadratic form $3x_1^2 + 5x_2^2 + 3x_3^2 - 2x_1x_2 - 2x_1x_3 + 2x_2x_3$ to canonical form and hence state nature, rank, index and signature of the quadratic form. (7M)

4. a) Trace the curve $r = a\ sin3\theta$. (7M)

b) Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} y\sqrt{x^2+y^2}\ dydx$ by transforming to polar coordinates. (7M)

5. a) Establish a relation between β and Γ functions. 6M)

b) Evaluate $\int_0^{\frac{\pi}{2}} cos^7\theta\ d\theta$ by using β, Γ functions. (4M)

c) Express $\int_0^1 \frac{x\,dx}{\sqrt{1-x^5}}$ in terms of β function. (4M)

6. a) Find the angle between the surfaces $ax^2 + y^2 + z^2 - xy = 1$ and conservative $bx^2y + y^2z + z = 1$ at (1, 1, 0). (7M)

b) Show that $\bar{F} = (y^2 - z^2 + 3yz - 2x)\,\bar{\imath} + (3xz + 2xy)\bar{\jmath} + (3xy - 2xz + 2z)\bar{k}$ is both solenoidal and irrotational. (7M)

7. a) State Greens theorem in plane and apply the theorem to evaluate $\oint_C x^2y\,dx + y^3dy$, where C is the closed path formed by $y = x,\ y = x^3$ from (0, 0) to (1, 1). (7M)

b) Evaluate $\int_S \bar{F}.\overline{ds}$ using Gauss divergence theorem, where $\bar{F} = 2xy\,\bar{\imath} + yz^2\,\bar{\jmath} + z\,\bar{k}$ and S is the surface of the region bounded by $x = 0,\ y = 0,\ z = 0,\ x + 2z = 6$. (7M)

Subject Code: R13204/R13 **Set No - 1**

I B. Tech II Semester Supplementary Examinations, April/May - 2017

ENGINEERING CHEMISTRY

(Com. to ECE, EEE, EIE, Bio-Tech., E Com E, Agri E)

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

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

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PART-A

1. (a) Explain boiler corrosion and how it can be minimized.
   (b) Write notes on (i) galvanic cells (ii) electroplating (iii) natural gas.
   (c) Write the engineering applications of fullerenes.
   (d) How is styrene butadiene rubber prepared? What are its applications?

[4+12+ 3+3]

PART-B

2. (a) Discuss the complexometric titration method for estimation of hardness of water.
   (b) Explain permutit process for softening of hard water.
   (c) What are the drawbacks of natural rubber? Explain how to overcome these drawbacks.

[6+4+6]

3. (a) What is meant by ion-selective electrode? Explain the working of glass electrode.
   (b) What are primary and secondary batteries? Give examples.
   (c) Explain fractional distillation of petroleum with a neat sketch.

[6+4+6]

4. (a) Explain the environmental factors that are affecting rate of corrosion.
   (b) Explain how sacrificial anodic process controls the base metal corrosion.
   (c) Explain setting and hardening of cement with proper chemical equations.

[6+4+6]

5. (a) How is Bakelite prepared? Mention its applications.
   (b) What is tacticity? Explain the significance of stereoregular polymers.
   (c) What are paints? Mention their constituents and functions.

[6+4+6]

6. (a) Explain proximate analysis of coal and its significance.
   (b) Write notes on petrol knocking.
   (c) Write notes on disinfection and sterilization.

[6+4+6]

7. (a) What are conducting polymers and explain p-type conducting polymers.
   (b) Explain any one method for preparation of carbon nanotubes.
   (c) Explain the working of fuel cell with example and mention its advantages.

[6+4+6]

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Subject Code: R13207/R13 **Set No - 1**

I B. Tech II Semester Supplementary Examinations April/May - 2017

MATHEMATICS-II (MATHEMATICAL METHODS)

(Common to CE, ME, CSE, PCE, IT, Chem E, Aero E, Auto E, Min E, Pet E, Metal E, Textile Engg.)

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

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

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PART-A

1. (a) Write the working rule to find the root of the equation y= f(x) by False position method.
   (b) Prove that $(1+\nabla)(1-\nabla)=1$
   (c) By RK method of second order find y (0.3) given that $\frac{dy}{dx}=x-y,\ y(0)=1$
   (d) Expand f(x) = $\begin{cases} x, 0<x<\pi \\ 0, \pi<x<2\pi \end{cases}$ as Fourier series.
   (e) If $F_s(p)$ is Fourier sine transform of f(x). Then prove that
   $F_s[f(x)\cos ax]=\frac{1}{2}[F_s(p+a)+F_s(p-a)]$
   (f) Find $Z[a^n]$.

[3+3+4+4+4+4]

PART-B

2. (a) Find the root of the equation $x^3-9x+1=0$ by using Newton Raphson method.
   (b) Find the root of the equation $xe^x=1$ by using bisection method.

[8+8]

3. (a) Find f(2.5) using Newton's forward formula for the following table

x	0	1	2	3	4	5	6
y=f(x)	0	1	16	81	256	625	1296

   (b) Find the Lagrange's polynomial for the following data

x	0	2	3	6
y	648	704	729	792

[8+8]

4. (a) By modified Euler's method find y (0.2) ,y(0.4) given that $\frac{dy}{dx}=y^2-x,\ y(0)=1$
   (b) Obtain Picard's expansion for $\frac{dy}{dx}=x+y,\ y(0)=1$, hence evaluate y (0.1).

[8+8]

5. (a) Find the half-range sine series for the function f(x) = x^2 in the range 0<x<2.
   (b) Find the Fourier expansion for f(x) = sinax in [0, π].

[8+8]

6. (a) Find the Fourier transform of f(x) defined by $f(x) = 1 - x^2 - 1 < x < 1$
   (b) Find the Fourier cosine transform of e^{-ax}, a > 0 and hence deduce the inversion formula $\int_0^\infty \frac{\cos px}{a^2 + p^2} dp$

[8+8]

7. (a) Find the inverse Z – transform of $\left[\frac{z}{z^2 + 11z + 24}\right]$
   (b) Using Z – transforms, solve $y_{n+2} - 6\, y_{n+1} + 9\, y_n = 3^n$ with $y_0 = 0$ and $y_1 = 1$.

[8+8]

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Subject Code: R10202/R10 **Set No - 1**

I B. Tech II Semester Supplementary Examinations April/May - 2017

MATHEMATICS-II

(Common to All Branches)

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

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Find the Laplace transform of unit step function.
   (b) Find the L[1-cost/t].

[7+8]

2. (a) Find $L^{-1}\left\{\log\left(\frac{s+1}{s-1}\right)\right\}$.
   (b) Solve $(D^2 + 2D - 3)y = sint; y(0) = y'(0) = 0$, using Laplace transforms.

[7+8]

3. (a) Expand $\frac{\pi^2}{12} - \frac{x^2}{4}$ as a Fourier series in $(-\pi, \pi)$.
   (b) Find the Half range cosine series of f(x) = 4x in [0, 2].

[8+7]

4. (a) Prove that $F\{x^n f(x)\} = (-i)^n \frac{d^n}{dp^n}[F(p)]$
   (b) Find finite Fourier cosine transform of f(x) = x + a for $0 < x < \pi$.

[8+7]

5. (a) Form the P.D.E. by eliminating ϕ from $\phi\,(x + y + z,\ x^2 + y^2 - z^2) = 0$.
   (b) Solve $(y + z)p - (z + x)q = x - y$.

[7+8]

6. Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, subject to the conditions $u(0, y) = u(l, y) = u(x, 0) = 0$ and $u(x, a) = \sin\frac{n\pi x}{l}$. [15]

7. (a) Find u_2, u_3 if $\bar{u}(z) = \frac{(2z^2+5z+14)}{(z-1)^4}$.
   (b) Find the inverse Z- transform of $\frac{4z^2-2z}{z^3-5z^2+8z-4}$.

[7+8]

8. (a) Show that $\beta(m,n) = \int_0^\infty \frac{x^{m-1}}{(1+x)^{m+n}}\,dx = \int_0^\infty \frac{x^{n-1}}{(1+x)^{m+n}}\,dx$
   (b) Evaluate $4\int_0^\infty \frac{x^2}{1+x^4}\,dx$ using beta gamma function.

[8+7]

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