Code: 9ABS301

R09

B.Tech II Year I Semester (R09) Supplementary Examinations June 2017

MATHEMATICS - II

(Common to AE, BT, CE & ME)

Time: 3 hours | Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Solve the system λ x + y + z = 0; x + λ y + z = 0; x + y + λ z = 0, if the system has non-zero solution only.

(b) Solve the equations: x + y – z + t = 0; x – y + 2z – t = 0; 3x + y + t = 0.

2 (a) Reduce the quadratic form to canonical form by Lagrange's reduction:

$$2x_1^2+7x_2^2+5x_3^2-8x_1x_2-10x_2x_3+4x_1x_3$$

And hence find rank signature of the quadratic form.

(b) Find the rank and signature of the quadratic form $\boldsymbol{x^2-4y^2+6z^2+2xy-4xz+2w^2-6zw}$.

3 (a) If $f(x)=x^2,\ -l\le x\le l,$ obtain the Fourier series and deduce that $\frac{\pi^2}{12}=\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}+----$

(b) Expand $f(x)=e^x$ as a Fourier series in the interval $(-l,l)$

4 Find the Fourier transform of $f(x)=\begin{cases} a^2-x^2, & if\ |x|<a \\ 0, & if\ |x|>a>0 \end{cases}$

Hence show that $\int_0^\infty \frac{\sin x-\cos x}{x^3}dx=\frac{\pi}{4}$

5 (a) Form the partial differential equation by eliminating the arbitrary function f from

$xyz = f(x^2 + y^2 + z^2)$.

(b) Using the method of separation of variables, solve $u_{xt} = e^{-t}\cos x$ with $u(x, 0) = 0$ and $u(0, t) = 0$.

6 (a) Evaluate: (i) $\Delta[f(x)\,g(x)]$ (ii) $\Delta\left[\frac{f(x)}{g(x)}\right]$.

(b) Given $u_0 = 580$, $u_1 = 556$, $u_2 = 520$ and $u_4 = 385$ find u_3.

7 (a) Fit the curve $y = ae^{bx}$ to the following data:

x	0	1	2	3	4	5	6	7	8
y	20	30	52	77	135	211	326	550	1052

(b) The following gives the velocity of a particle at time t.

t(sec.)	0	2	4	6	8	10	12
ν*(m/sec.)*	4	6	16	34	60	94	136

Find the distance moved by the particle in 12 sec. and also the acceleration at t = 2 sec.

8 Use Milne's method to find y(0.8) and y(1.0) from $y' = 1 + y^2$, y(0) = 0. Find the initial values y(0.2), y(0.4) and y(0.6) from the Taylor's series method.

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Code: 13A54302 **R13**

B.Tech II Year I Semester (R13) Supplementary Examinations June 2017

MATHEMATICS – III

(Common to EEE, ECE and EIE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Write any two properties of beta function.

(b) Compute the value of $\Gamma(-1/2)$.

(c) Show that $p_1(x) = x$.

(d) State the orthogonal property of Bessels differential equation.

(e) Check whether u(x, y) = sin x coshy is harmonic function.

(f) Discuss about a Transformation w = z + c, where 'c' is complex constant.

(g) Evaluate $\int_C e^z dz$ where C is $|z| = 1$.

(h) Expand $f(z) = e^z$ in Taylor's series about z = 1.

(i) Find the residue at z =1 of the function $f(z) = \dfrac{z^2}{(z-1)(z-2)^2}$.

(j) State Cauchy's residue theorem.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Prove that $\int_0^\infty x^{n-1} e^{-kx}\, dx = \dfrac{\Gamma n}{k^n} \quad (n > 0, k > 0)$.

(b) Prove that $\int_0^{\frac{\pi}{2}} Sin^{2m-1}\theta \cos^{2n-1}\theta\, d\theta = \dfrac{\beta(m,n)}{2}$.

OR

3 Solve in Series the equation $x\dfrac{d^2y}{dx^2} + \dfrac{dy}{dx} + xy = 0$

UNIT – II

4 (a) Prove that $\dfrac{d}{dx}\left[x J_n(x) J_{n+1}(x)\right] = x\left[J_n^2(x) - J_{n+1}^2(x)\right]$.

(b) Express $J_5(x)$ in terms of $J_0(x)$ and $J_1(x)$.

OR

5 State and prove the Rodrigues formula of Legendre Polynomials.

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UNIT – III

6 (a) State and prove the Cauchy- Riemann equations in polar form.

(b) If $f(z) = u + iv$ is Analytic function of z, find f(z) if $2u + v = e^{2x}\left[(2x + y)\cos 2y + (x - 2y)\sin 2y\right]$

OR

7 (a) Find the bilinear Transformation which maps the points $z = \infty, i, 0$ into the points $w = -1, -i, 1$.

(b) Discuss about the Transformation $w = z^2$

UNIT – IV

8 (a) Evaluate $\int_c \frac{\sin^2 z}{\left(z - \frac{\pi}{6}\right)^3}\, dz$, where c is the circle $|z| = 1$.

(b) Verify cauchy's theorem for the integral of z^3 taken over the boundary of the rectangle with vertices $-1, 1, 1+i, -1+i$

OR

9 Find the Laurent series expansion of $\frac{z^2 - 6z - 1}{(z-1)(z-3)(z+2)}$ in the region $3 < |z+2| < 5$

UNIT – V

10 (a) Evaluate $\int_c \frac{dz}{(z^2+4)^2}$,using residue theorem, where c: $|z - i| = 2$

(b) Determine the Residue of the function $f(z) = \frac{z+1}{z^2(z-2)}$ at each pole.

OR

11 Show that $\int_0^{2\pi} \frac{\cos 2\theta}{1 - 2a\cos\theta + a^2} = \frac{2\pi a^2}{1 - a^2} \quad where \;\; a^2 < 1$

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