(Please write your Exam Roll No.) Exam Roll No. ....

END TERM EXAMINATION

SECOND SEMESTER [B.TECH.] MAY- JUNE 2017

Paper Code: BA-108	Subject: Mathematics-II
Time: 3 Hours	Maximum Marks: 60

Note: Attempt any six questions.

Q1 (a) For the matrix $A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & -1 \end{bmatrix}$. Find the non-singular matrices P and Q such that PAQ is in the normal form. (5)

(b) Show that the system of linear equations is not consistent (5)
$5x + 3y + 7z = 4, 3x + 26y + 2z = 9,\ 7x + 2y + 10z = 5$

Q2 (a) Show that the characteristics roots of a skew-Hermitian matrix are purely imaginary. (5)

(b) Find the eigen values and eigenvectors of the matrix associated with quadratic form. (5)
$8x^2 + 7y^2 + 3z^2 - 12xy + 4xz - 8yz$

Q3 (a) Find analytic function $f(z) = u + iv$, if $u - v = e^x(\cos y - \sin y)$. (5)

(b) Use calculus of residue to show that $\int_0^{\pi} \frac{d\theta}{a+b\cos\theta}$, where $a > |b|$. Hence or otherwise evaluate $\int_0^{2\pi} \frac{d\theta}{\sqrt{2}-\cos\theta}$. (5)

Q4 (a) Evaluate $\oint_C \frac{e^z}{\cos \pi z}$ where C is the unit circle $|z| = 1$. (5)

(b) Prove that $w = \frac{z}{1-z}$ map the upper half of the z-plane onto the upper half of the w-plane. What is the image of circle $|z|=1$ under this transformation? (5)

Q5 (a) Obtain Taylor/Laurent's series expansion for $f(z) = \frac{1}{(1+z)(3+z)}$, which are valid (i) $|z| = 1$ (ii) $1 < |z| < 3$. (5)

(b) Solve $x^3 \frac{d^3y}{dx^3} + 2x^2 \frac{d^2y}{dx^2} + 2y = 10(x + \frac{1}{x})$ (5)

Q6 (a) Solve $(2x \log x - xy)\, dy + 2y\, dx = 0$ (5)

(b) Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = xe^x \sin x$. (5)

Q7 (a) Prove that for Bessel's function $J_n(x)$, $x J'_n(x) = xJ_{n-1}(x) - nJ_n(x)$. (5)

(b) Prove that for Legendre polynomial $P_n(x)$
$(n+1)P_{n+1}(x) = (2n+1)x P_n(x) - n P_{n-1}(x)$. (5)

Q8 (a) A speaks truth in 75% and B in 80% of the cases. In what percentage of cases are they likely to contradict each other narrating the same incident? (5)

(b) An urn contains 5 white and 8 black balls. Two successive draw of three balls at a time are made such that (i) the balls are replaced before the second trial; (ii) the balls are not replaced before the second trial. Find the probability in each case that the first drawing will give 3 white and the second 3 black balls. (5)

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B-3

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END TERM EXAMINATION

SECOND SEMESTER [B.TECH.] MAY -JUNE 2016

Paper Code: BA-108	**Subject: Mathematics-II**
Time: 3 Hours	**Maximum Marks: 60**

Note: Attempt any six questions.

Q1 (a) For the matrix $A=\begin{bmatrix}1 & 1 & 1\\ 1 & -1 & -1\\ 3 & 1 & 1\end{bmatrix}$, find the non-singular matrices P *and* Q such that PAQ is in the normal form. (5)

(b) Show that the system of linear equations is not consistent: (5)

$$x+y+z=-3,\quad 3x+y-2z=-2,\quad 2x+4y+7z=7$$

Q2 (a) Show that the characteristic roots of a Hermitian matrix are real. (5)

(b) Find a non-singular matrix P such $P^T AP$ is a diagonal matrix, where A is the matrix associated with quadratic form $6x^2+3y^2+3z^2-4xy+4xz-2yz$ and P^T is the transpose of P. (5)

Q3 (a) Find analytic function $f(z)=u+iv$, if $u-v=(x-y)(x^2+4xy+y^2)$, $z=x+iy$. (5)

(b) Use calculus of residue to show that $\int_0^{2\pi}\frac{\cos 2\theta}{5+4\cos\theta}d\theta=\frac{\pi}{6}$. (5)

Q4 (a) Evaluate $\int_{|z|=3}\frac{e^{2z}}{(z+1)^4}dz$. (5)

(b) Find the image in the w-plane of the circle $|z-3|=2$ in the z-plane under the inverse mapping $w=\frac{1}{z}$. (5)

Q5 (a) Obtain Taylor/Laurent's series expansion for $f(z)=\frac{(z-2)(z+2)}{(z+1)(z+4)}$, which are valid (i) $|z|<1$ (ii) $|z|>4$. (5)

(b) Solve $(1+x)^2y''+(1+x)y'+y=4\cos(\log(1+x))$ (5)

Q6 (a) Solve $y(xy+2x^2y^2)dx+x(xy-x^2y^2)dy=0$ (5)

(b) Solve $\frac{d^2y}{dx^2}+5\frac{dy}{dx}+6y=e^{-2x}\sin 2x$ (5)

Q7 (a) Prove that $J_{n+1}(x)=\frac{2n}{x}J_n(x)-J_{n-1}(x)$ and express $J_4(x)$ in terms of $J_1(x)$ and $J_0(x)$ where $J_n(x)$ is the Bessel's functions. (5)

(b) Prove that $P_n(x)=\frac{1}{2^n n!}\frac{d^n}{dx^n}(x^2-1)^n$, where $P_n(x)$ is Legendre polynomial. (5)

Q8 (a) Two players A and b participate in a game of throwing two dice. The first player who gets a sum of 7 is awarded the prize. If A starts the game, find the probability of their winning. (5)

(b) Four boxes A, B, C, D contains fuses. The boxes contain 5000, 3000, 2000 and 1000 fuses respectively. The percentage of fuses in the boxes which are defective are 3%, 2%, 1% and 0.5% respectively. One fuse is selected at random arbitrarily from one of the boxes. It is found to be a defective fuse. Find the probability that it has come from box D. (5)

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END TERM EXAMINATION

SECOND SEMESTER [B.TECH] MAY-JUNE 2014

Paper Code: BA-108 **Subject: Mathematics-II**

Time: 3 Hours **Maximum Marks: 60**

Note: Attempt any six questions.

Q1 (a) For the matrix $A = \begin{bmatrix} 3 & 2 & -1 \\ 4 & 2 & 6 \\ 7 & 4 & 5 \end{bmatrix}$, find the rank of the A by reducing it into normal form. (5)

(b) Show that the system of linear equations is consistent. Also, solve them.
$x + 2y - z = 3, 3x - y + 2z = 1, 2x - 2y + 3z = 2, x - y + z = -1$ (5)

Q2 (a) Determine the value of λ for which the system of equations possesses a solution.
$x + y + z = 1, x + 2y + 4z = \lambda, x + 4y + 10z = \lambda^2$ (5)

(b) Find the eigen value and the corresponding eigen vectors of the matrix A $= \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$. (5)

Q3 (a) Find analytic function whose imaginary part is $v = \frac{x-y}{x^2+y^2}$. (5)

(b) Use calculus of residue to show that:-
$$\int_0^{2\pi} \frac{\sin^2\theta}{a+b\cos\theta} d\theta = \frac{2\pi}{b^2}\{a - \sqrt{a^2 - b^2}\}, 0 < b < a.$$ (5)

Q4 (a) Evaluate :- $\int_{|z-1|=3} \frac{e^z}{(z+1)^2(z-2)} dz$. (5)

(b) Find the condition where the transformation $w = \frac{az+b}{cz+d}$ transform the unit circle in the w-plane into a straight line in the z-plane. (5)

Q5 (a) Determine the Laurent series expansion about Z = 1 and name the singularity of the function:- $f(z) = \frac{e^{2z}}{(z-1)^3}$. (5)

(b) Solve:- $(3 + 2x)^2 \frac{d^2y}{dx^2} - 2(3 + 2x)\frac{dy}{dx} - 12y = 6x$. (5)

Q6 (a) Solve:- $(y^2 + 2x^2y)dx + (2x^3 - xy)dy = 0$. (5)

(b) Solve:- $\frac{d^2y}{dx^2} + y = \sec x$ (5)

Q7 (a) Prove that $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$ and $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \cos x$, where $J_n(x)$ is the Bessel's functions. (5)

(b) Show that the Legendre polynomials $P_n(x)$ are orthogonal in the interval [-1,1]. (5)

Q8 (a) A fair coin is tossed four times. Find the probability that they are all heads if the first two tosses result in head. (5)

(b) Two players A and B participate in a game of throwing two dice. The first player who gets a sum 7 is awarded the prize. If A starts the game, fine the probabilities of their winning. (5)

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(b) Evaluate the integral (5)

$$I = \int_0^{2\pi} \frac{d\theta}{2+\sin\theta}$$

Q7. (a) Evaluate the integral (4)

$$I = \oint_c \frac{dZ}{Z^4+1}, \quad C: |Z-1=1|$$

(b) Show that the transformation $W = \frac{2Z+3}{Z-4}$ maps the circle $x^2+y^2-4x=0$ on to the straight line $4u+3=0$. Explain why the curve obtained is not a circle? (4)

(c) A die is thrown twice and the sum of the numbers appearing, is noted to be 8. What is the conditional probability that the numbers 5 has appeared at least once? (2)

Q8. (a) Solve by method of variation of parameters $\frac{d^2y}{dx^2} - y = e^{-x}\sin(e^{-x}) + \cos(e^{-x})$. (4)

(b) Prove that $(1-x^2)P_n'(x) = n[P_{n-1}(x) - xP_n(x)]$, where $P_n(x)$ is the legendre polynormal of order n. (4)

(c) Prove that $e^{\frac{x}{2}(t-\frac{1}{t})}$ is the generating function of the Bessel's function. (2)

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Exam Roll No. 091......................

END TERM EXAMINATION

SECOND SEMESTER [B.TECH.(CSE)]– MAY 2011

Paper Code: BA-108 **Subject: Mathematics-II**

Time : 3 Hours **Maximum Marks : 60**

Note: Attempt any five questions.

Q1 (a) If A and B are similar nxn matrices with entries from a field F, show that A and B have the same characteristic polynomial. Is this true for two nonsimilar matrices? Prove your assertion. **(6)**

(b) Let $A=\begin{bmatrix} a & b \\ c & d \end{bmatrix} \in F^{2x2}$, $b \neq 0$ and $\mu \in F$, is a root of the polynomial $bx^2+(a-b)x+c=0$, then $a+b\mu$ is an eigen value of A with eigenvector $\begin{bmatrix} 1 \\ \mu \end{bmatrix}$. **(6)**

Q2 (a) Find the eigen vectors and eigen values of the matrix $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$ **(4)**

(b) Find a matrix P such that PAP^{-1} is diagonal. **(4)**

(c) Compute $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}^{30}$. **(4)**

Q3 (a) If $f(z)=u(x,y)+iv(x,y)$ is an analytic function of z and $u-v=\dfrac{Cosz+Sinz-e^{-y}}{2Cosz-e^{y}-e^{-y}}$, find $f(z)$ subject to the condition that $f(\pi/2)=0$. **(8)**

(b) Prove that the function $u(x,y)=y^3-3x^2y$ is harmonic and obtain its harmonic conjugate. **(4)**

Q4 Evaluate-

(a) $\int_C \dfrac{Sin\pi z^2+Cos\pi z^2}{(z-1)(z-2)}dz$, where C is the circle $|z|=3$. **(6)**

(b) $\int_C \dfrac{9z^2-iz+4}{z(z^2+1)}dz$, where C is the circle $|z|=2$ traversed in the positive sense. **(6)**

Q5 (a) Evaluate $\int_0^\infty \dfrac{Sinmx}{x}dx$, m>0. **(6)**

(b) Find the residue of $\dfrac{z^3}{(z-1)^4(z-2)(z-3)}$ at z=1. **(6)**

OR

Find all the Mobiles transformations which transform the unit circle $|z|=1$ into the unit circle $|w|\leq 1$.

P.T.O.

P1P2