BT-MRE-I & II-05.17-0671 Reg. No. | | | | | | | | |

B

B. Tech. Degree I &II Semester Examination in Marine Engineering May 2017

MRE 1102 ENGINEERING MATHEMATICS II

(2013 Scheme)

Time: 3 Hours Maximum Marks: 100

(5 × 20 = 100)

I. (a) Reduce the matrix A to its normal form and hence find its rank, where (7)

$$A=\begin{pmatrix}0 & 1 & 2 & -2\\ 4 & 0 & 2 & 6\\ 2 & 1 & 3 & 1\end{pmatrix}$$

(b) Test the consistency and then solve the system (7)

$x+y+z=6$

$x-y+z=2$

$2x-y+3z=9$

(c) Verify Cayley-Hamilton theorem for the matrix $A=\begin{pmatrix}1 & 2\\ -1 & 3\end{pmatrix}$. (6)

OR

II. (a) Show that the function $f(z)=\begin{cases}\dfrac{x^3(1+i)-y^3(1-i)}{x^2+y^2}, & z\neq 0\\ 0, z=0\end{cases}$ satisfies the Cauchy Riemann Equations at the origin, but not analytic there. (7)

(b) Expand $f(z)=\dfrac{1}{(z-1)}$ as a Laurent's series in the region $|z|>1$. (6)

(c) Evaluate $\int_C \dfrac{1}{(z^2+4)}dz$, where C is the circle $|z-i|=2$. (7)

III. (a) Obtain the differential equation corresponds to the family of straight lines $y=mx$. (6)

(b) Solve $\dfrac{dy}{dx}=\tan(x+y)-1$. (7)

(c) Solve $\dfrac{dy}{dx}=(x+e^y-1)e^{-y}$. (7)

OR

IV. (a) Solve $\dfrac{d^2y}{dx^2}+3\dfrac{dy}{dx}+2y=0$. (5)

(b) Solve $(D^2-4D+4)y=e^{3x}\cos(4x)$. (7)

(c) Find a particular integral (P.I.) of $\dfrac{d^2y}{dx^2}-2\dfrac{dy}{dx}-3y=64xe^{-x}$, by the variation of parameters method. (8)

(P.T.O.)

V. (a) Find a Fourier Series of $f(x)$, defined by (10)

$$f(x)=\begin{cases}\pi x, 0\le x\le 1\\ \pi(2-x), 1\le x\le 2\end{cases}$$

Hence deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+........=\frac{\pi^2}{8}$.

(b) Express $f(x)=x$ as a half range sine series and a half range cosine series in $0<x<2$. (10)

OR

VI. (a) Find the Fourier sine transform of $\frac{e^{-ax}}{x}$. (8)

(b) Show that $\beta(p,q)=\int_0^\infty \frac{y^{q-1}}{(1+y)^{p+q}}dy=\int_0^1 \frac{x^{p-1}+x^{q-1}}{(1+x)^{p+q}}dx$ (12)

VII. (a) Find the Laplace transform of (8)

(i) $t^2\cos(at)$ (ii) $\frac{1-\cos t}{t^2}$

(b) Find the inverse Laplace transform of (12)

(i) $\frac{s}{(s^2+a^2)^2}$ (ii) $\log\left(\frac{s+1}{s-1}\right)$

OR

VIII. (a) Using Laplace transform, solve the equation (10)

$\frac{d^2x}{dt^2}-2\frac{dx}{dt}+x=e^t$, with $x=2, \frac{dx}{dt}=-1$ at $t=0$.

(b) If $f(t)$ is a periodic function with period T, then prove that (10)

$$L\{f(t)\}=\frac{\int_0^T e^{-st}f(t)dt}{1-e^{-sT}}.$$

IX. (a) An urn A contains 2 white and 4 red balls. Another urn B contains 5 white and 7 red balls. A ball is transferred from urn A to B and then a ball is drawn from the urn B. Find the probability that it is white. (10)

(b) Fit a binomial distribution to the following frequency distribution: (10)

x :	0	1	2	3	4	5	6
f :	12	25	51	57	31	15	4

OR

X. (a) Derive the Poisson distribution as the limiting case of Binomial distribution. (10)

(b) In a normal distribution, 7% of the items are under 35 and 89% are under 63. Find the mean and standard deviation. (10)

***