BT-MRE-I & II/05.15-0558 Reg. No. | | | | | | | | |

C

B.Tech. Degree I & II Semester Examination in Marine Engineering May 2015

MRE 1102 ENGINEERING MATHEMATICS II

Time: 3 Hours Maximum Marks: 100

(5 × 20 = 100)

I. (a) Express the following matrix as the sum of a symmetric and a skew-symmetric matrix. (8)

$$A=\begin{bmatrix}-1 & 7 & 1\\ 2 & 3 & 4\\ 5 & 0 & 5\end{bmatrix}$$

(b) Verify Cayley-Hamilton theories for the matrix (8)

$$A=\begin{bmatrix}2 & -1 & 1\\ -1 & 2 & -1\\ 1 & -1 & 2\end{bmatrix}$$

Hence compute A^{-1}

(c) Solve the equations: (4)

$x_1+3x_2+2x_3=0;\quad 2x_1-x_2+3x_3=0;$

$3x_1-5x_2+4x_3=0;\quad x_1+17x_2+4x_3=0.$

OR

II. (a) Simplify: $\left(\frac{cos\theta+i\,Sin\theta}{sin\theta+i\,cos\theta}\right)^4$ (8)

(b) Determine: a,b,c,d so that the function (8)

$f_{(z)}=\left(x^2+axy+by^2\right)+i\left(cx^2+dxy+y^2\right)$ is analytic

(c) Evaluate $\int_c \frac{Cos\pi z^2}{(z-1)(z-2)}dz$ where C is the circle $|z|=3$ (4)

III. (a) Form the differential equation of all circles of radius *a*. (8)

(b) Solve: $(x+y+1)^2\frac{dy}{dx}=1$ (6)

(c) Solve: $\left(1+y^2\right)dx=\left(\tan^{-1}y-x\right)dy$ (6)

OR

IV. (a) Solve: $\frac{d^2y}{dx^2}-4y=xSinhx$ (6)

(b) Find the particular integral of $(D-2)^2y=8\left(e^{2x}+Sin2x+x^2\right)$ (6)

(c) Solve the simultaneous equations: (8)

$\frac{dx}{dt}+4x+3y=t$

$\frac{dy}{dt}+2x+5y=e^t$

(P.T.O.)

V. (a) Find a Fourier series to represent x-x^2 from $x=-\pi$ to $x=\pi$. Hence show that (10)

$$\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\ldots\ldots=\frac{\pi^2}{12}$$

(b) Obtain Fourier series for the function $f(x)$ given by (10)

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

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

OR

VI. (a) Expand $\pi x-x^2$ in a half-range sine series in the interval $(0,\pi)$ upto the first three terms. (6)

(b) Find the Fourier transform of $f(x)=\begin{cases}-x^2 \text{ if } |x|<1\\ 0 \text{ if } |x|>1.\end{cases}$ (8)

(c) Prove that $\int_0^1\frac{dx}{\sqrt{1-x^4}}=\frac{\sqrt{\pi}}{4}\cdot\frac{\lceil 1/4}{\lceil 3/4}$ (6)

VII. (a) Find the Laplace transform of: (5 + 5 = 10)

(i) $t\,Sin^2 3t$ (ii) $\dfrac{e^{-t}Sin t}{t}$

(b) Find the inverse Laplace transform of: (5 + 5 =10)

(i) $\dfrac{2s^2-4}{(SH)(S-2)(S-3)}$ (ii) $\dfrac{S}{S^4+S^2+1}$

OR

VIII. (a) Apply convolution theorem to evaluate (10)

$$L^{-1}\left\{\frac{S^2}{(S^2+a^2)(S^2+b^2)}\right.$$

(b) Solve the equation using transformation method (10)

$$\frac{d^2x}{dt^2}+\frac{2dx}{dt}+5x=e^{-t}\sin t;\ x(0)=0, x^1(0)=1$$

IX. (a) For two events A and B, let P(A) = 0.4, P(B) = p and P(A$\cup$B)=0.6 (6)

(i) Find p so that A and B are independent events.

(ii) For what value of p are A and B are mutually exclusive?

(b) The contents of urns I, II and III are as follows: (8)
1 White, 2 black and 3 red balls
2 White, 1 black and 1 red balls and
4 White, 5 black and 3 red balls.
One urn is chosen at random and two balls drawn. They happen to be white and red. What is the probability that they come from urns 1, II or III?

(c) Find the standard deviation for the following discrete distribution: (6)

x:	8	12	16	20	24
$p(x)$:	$\frac{1}{8}$	$\frac{1}{6}$	$\frac{3}{8}$	$\frac{1}{4}$	$\frac{1}{12}$

OR

(Continued.....3)

X. (a) If the sum of mean and variance of a binomial distribution is 4.8 for five trials, find the distribution. (5)

(b) An urn contains 10 white and 3 black balls, while another urn contains 3 white and 5 black balls. Two balls are drawn form the first urn and put into the second urn and then a ball is drawn from the latter. What is the probability that it is a white ball? (7)

(c) In a partially destroyed laboratory record of an analysis of a correlation data, the following results only are eligible: variance of x = 9 (8)

Regression equations: $8x-10y+66=0$,

$40x-18y=214$.

What were (i) the mean value of x and y

(ii) standard deviation of y

(iii) correlation coefficient between x and y.

***