

--	--	--	--	--	--	--	--

**B.Tech. Degree I & II Semester Examination in
Marine Engineering May 2019**

**MRE 1102 ENGINEERING MATHEMATICS II
(2013 Scheme)**

Time: 3 Hours

Maximum Marks: 100

(5 × 20 = 100)

- I. (a) Find the value of k such that the rank of the matrix A is 3, where (4)

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

- (b) Check consistency and solve, $4x - y = 12$, $-x + 5y - 2z = 0$, (6)

$$-2y + 4z = -8$$

- (c) Find the Eigen values and Eigen vectors of $\begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$ (10)

OR

- II. (a) Expand $f(z) = \frac{1}{(z-1)(z-2)}$ in the region $|z| < 1$ (10)

- (b) State and prove the necessary conditions for function $f(z)$ to be analytic. (10)

- III. (a) Solve $y - x \frac{dy}{dx} = a(y^2 + \frac{dy}{dx})$ (8)

- (b) Solve $xy(1 + xy^2) \frac{dy}{dx} = 1$ (5)

- (c) Find the orthogonal trajectories of $\frac{x^2}{a^2} + \frac{y^2}{b^2 + \lambda}$ where λ is the parameter. (7)

OR

- IV. (a) Solve by the method of variation of parameters $\ddot{y} - 2\dot{y} + y = e^x \cdot \log x$. (10)

- (b) Solve $(\frac{d^2x}{dt^2} - 2x)^2 = 8e^{2t} + 8\sin 2t + 8x^2$. (10)

- V. (a) If $f(x) = \begin{cases} x, & 0 < x < \pi/2 \\ \pi - x, & x > \pi/2 \end{cases}$ then expand $f(x)$ as a sine series in $(0, \pi)$. (10)

- (b) Find the half range cosine series for $\sin x$ in $(0, \pi)$. (10)

OR

- VI. (a) Prove that $\beta(m, n) = \frac{\Gamma m \Gamma n}{\Gamma(m+n)}$ (10)

- (b) Express the following integrals in terms of gamma function $\int_0^{\pi/2} \sqrt{\tan \theta} d\theta$. (10)

VII. (a) Find the Laplace transform of (10)

(i) $\sin 2t \sin 3t$

(ii) $\frac{\cos \sqrt{t}}{\sqrt{t}}$

(b) Derive the Laplace transform of a periodic function. (10)

OR

VIII. (a) Find the inverse transform by applying convolution theorem of $\frac{s}{(s^2 + a^2)^2}$ (5)

(b) Solve by the method of transforms the equation $y'' + 4y' + 3y = e^{-t}$ (15)
 $y(0) = y'(0) = 1$

IX. (a) A box A contains two white and four black balls. Another box B contains five white and seven black balls. A ball is transferred from box A to box B. A ball is drawn from box B. Find the probability that it is white. (10)

(b) A random variable X has the following probability function (10)

x	-2	-1	0	1	2	3
f(x)	0.1	k	0.2	2k	0.3	k

Find the value of k and calculate the mean and variance.

OR

X. (a) Prove that Poisson distribution is the limiting form of Binomial distribution. (8)

(b) X is a normal variate with mean 30 and standard deviation 5, find the probabilities that $26 \leq x \leq 40$, $x \geq 45$, $|x - 30| > 5$. (12)
