BT-MRE-II(R/S)-09.21-0542 Reg. No. | | | | | | | | | |

C

B.Tech. Degree II Semester Regular/Supplementary Examination in Marine Engineering September 2021

19-208-0201 ENGINEERING MATHEMATICSN II

(2019 *Scheme*)

Time: 3 Hours Maximum Marks: 60

(5 × 15 = 75)

I. (a) Solve the following system of equations by reducing to the normal form. (5)

$$x-3y+5z=18$$
$$-x+y+z=8$$
$$3x+y-2z=-11$$

(b) Show that the following system has a non trivial solution and solve completely using Echelon form. (6)

$$x-2y+z=0$$
$$6y-3z=0$$
$$x+4y-2z=0$$

(c) Find the Eigen values and corresponding Eigen vectors of the matrix. (4)

$$A=\begin{bmatrix} 6 & -3 \\ -2 & 1 \end{bmatrix}$$

OR

II. (a) State Cayley-Hamilton theorem .Verify the same for the following matrix. (7)

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

(b) Using Jacobi's iteration method, solve the following by taking six iterations. (8)

$$20x+y-2z=17$$
$$3x+20y-z=-18$$
$$2x-3y+20z=25$$

III. Solve the following:

(a) $\cos x(1+\cos y)dx-\cos y(1+\cos x)dy=0$ (5)

(b) $x^2dy+y(x+y)dx=0$ (5)

(c) $\frac{dy}{dx}+x\sin 2y=x^3\cos^2 y.$ (5)

OR

IV. (a) Solve the differential equation $\frac{d^3y}{dx^3}-2\frac{d^2y}{dx^2}+4\frac{dy}{dx}-8y=0.$ (5)

(b) Solve completely $\left(D^2-2D-3\right)y=\cos 2x.$ (5)

(c) Solve: (5)

$$\frac{dx}{dt}+2x-3y=5t$$
$$\frac{dy}{dt}-3x+2y=2e^{2t}$$

(P.T.O.)

V. (a) Write the Euler formulae to find a_0, a_n and b_n to find the Fourier series expansion of a periodic function $f(x)$ in the interval $[-l,+l]$. (3)

(b) Find the Fourier series expansion of the function $f(x)=\begin{cases}0, & -\pi<x\le 0\\ x, & 0<x<\pi\end{cases}$ and hence prove that $1+\frac{1}{3^2}+\frac{1}{5^2}+\ldots=\frac{\pi^2}{8}$. (12)

OR

VI. (a) Find the Fourier cosine series expansion of $x\sin x$ in $(0,\pi)$. (5)

(b) Define Beta and Gamma functions. Using them evaluate (5)

$$\int_0^{\pi/2}\left(\sqrt{\tan\theta}+\sqrt{\sec\theta}\right)d\theta$$

(c) Express the integral $\int_0^1 x^m\left(1-x^2\right)^n dx$ in terms of Beta function. (5)

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

(i) $e^{4t}\sin 2t\cos t$.

(ii) $\frac{\sin at-\sin bt}{t}$.

(b) Find the inverse Laplace transform of the following: (7)

(i) $\frac{2s^2-6s+5}{s^3-6s^2+11s-6}$.

(ii) $\frac{1}{2}\log\frac{s^2+b^2}{s^2+a^2}$.

OR

VIII. (a) Evaluate $\int_0^\infty \frac{\cos 2t-\cos 3t}{t}dt$. (6)

(b) Solve $ty''+2y'+ty=\cos t$ where $y(0)=1$. (9)

IX. (a) A problem of statistics is given to three students A, B and C whose chances of solving it are $\frac{1}{2},\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that exactly one will solve the problem? (5)

(b) Two urns I and II contain 3 red and 4 black balls, 2 red and 5 black balls respectively. A ball is transferred from urn I to urn II and then a ball is drawn from urn II. If the ball drawn is found to be red, find the probability that the ball transferred from urn I is red. (6)

(c) A random variable X has the following probability distribution. (4)

x	0	1	2	3	4
$P(x)$	0.25	0.15	0.2	0.1	0.3

Find: (i) $E(X)$ (ii) $E(X^2)$ (iii) $\mathrm{Var}(X)$ (iv) $\mathrm{Var}(3X+2)$.

OR

X. (a) The probability that a man hits a target is 1/5. If he makes 6 attempts ,find the probability that: (8)

(i) Exactly 2 will strike the target.

(ii) At least 2 will strike the target.

(b) The length of human pregnancies from conception to birth approximates a normal distribution with a mean of 266 days and a standard deviation of 16 days. What proportion of all pregnancies will last between 240 and 270 days (roughly between 8 and 9 months)? (7)

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