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B.Tech. Degree I & II Semester Supplementary Examination in Marine Engineering May 2018

MRE 102 ENGINEERING MATHEMATICS II
(Prior to 2013 Scheme)

Time: 3 Hours   Maximum Marks: 100

$(5 \times 20 = 100)$

I. (a) Find non singular matrices P and Q such that PAQ is in the normal form for

the matrix $A = \begin{bmatrix} 1 & -1 & -1 \\ 1 & 1 & 1 \\ 3 & 1 & 1 \end{bmatrix}$.

(b) For what values of λ and μ do the system of equations $x + y + z = 6,\ x + 2y + 3z = 10,\ x + 2y + \lambda z = \mu$ have (i) no solution   (ii) unique solution   (iii) more than one solution.

OR

II. (a) State and prove necessary condition for an analytic function and show by an example that the condition is not sufficient.

(b) State and prove Cauchy's Integral formula.

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

(b) Solve $xdy - ydx = \left(\sqrt{x^2 + y^2} \right) dx.$

OR

IV. (a) Solve $\dfrac{d^2y}{dx^2} - 4y = \left(He^x \right)^2.$

(b) Solve the following simultaneous equations $\dfrac{dx}{dt} = 7x - y;\quad \dfrac{dy}{dt} = 2x + 5y.$

V.   (a) Find Fourier expansion for the function $f(x) = x - x^2$ in the interval $-1 < x < 1.$

(b) Obtain the half range sine series for e^x in $0 < x < 1.$

OR

VI. (a) Find the Fourier integral representation of the function $f(x) = \begin{cases} 0, & x < 0 \\ \dfrac{1}{2}, & x = 0 \\ e^{-x}, & x > 0 \end{cases}.$

(b) Prove that $\beta(m, n) = \dfrac{\overline{|m}\ \overline{|n}}{\overline{|(m+n)}}.$

(P.T.O.)

VII. (a) Find the Laplace transform of (i) $t\, e^{-4t} \sin 3t$ (ii) $\dfrac{\cos at - \cos bt}{t}$.

(b) Find the inverse Laplace transform of (i) $\dfrac{4s+5}{(s-1)^2 (s+2)}$ (ii) $\log\left(\dfrac{s+1}{s-1}\right)$.

OR

VIII. (a) Apply convolution theorem to evaluate $L^{-1}\left[\dfrac{s^2}{(s^2+a^2)(s^2+b^2)}\right]$.

(b) Using Laplace transform solve $ty'' + 2y' + ty = \cos t$ given that $y(0)=1$.

IX. (a) A can hit a target 4 times in 5 shots; B can hit 3 times in 4 shots; C twice in 3 shots. They fire a valley. What is the probability that at least two shots hit?

(b) A bag contains 7 white, 6 red and 5 black balls. Two balls are drawn at random. Find the probability that they both will be white.

OR

X. (a) An urn contains 4 white and 3 red balls. Three balls are drawn with replacement from the urn. Find μ, σ^2, σ for the number of red balls drawn.

(b) Out of 800 families with 4 children each, how many families would be expected to have (i) 2 boys and 2 girls (ii) at least one boy (iii) no girl (iv) at most two girls. Assume equal probabilities for boys and girls.

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