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Mid Term Examination, Odd Semester, 2017-18

B.Tech. (I Year)- I Semester

Subject:- Engineering Mathematics-I

Subject Code:- AHM-1201

Time: 1 Hour

Max. Marks: 15

Section-A

Note: Attempt ALL questions.

(3×2=6)

1. By changing to echelon form, find the rank of the matrix :

$$\begin{bmatrix} 2 & 3 & 4 & -1 \\ 5 & 2 & 0 & -1 \\ -4 & 5 & 12 & -1 \end{bmatrix}$$

2. (a) Two eigen values of a  $3 \times 3$  non-singular matrix are 2 and 3. If the sum of 'product of two eigen values taken at a time' is 11, then find the characteristic equation of the matrix.

(b) If  $A$  is any square matrix, prove that  $A + A^\theta$  is Hermitian, where  $A^\theta$  denotes the transpose-conjugate of  $A$ .

3. Write the condition for a differential equation  $\frac{dy}{dx} = \frac{M(x,y)}{N(x,y)}$  to be exact. Find the solution of  $(e^y + 1) \cos x \, dx + e^y \sin x \, dy = 0$ .

Section-B

Note: Attempt ALL questions.

(3×3=9)

1. For what values of  $\lambda$  and  $\mu$ , the system of equations,

$$2x + 3y + 5z = 9, 7x + 3y - 2z = 8, 2x + 3y + \lambda z = \mu \text{ will}$$

have: (i) infinitely many solutions (ii) unique solution (iii) no solution. Also solve the system for  $\lambda = 5$  and  $\mu = 10$ .

P. T. O.

2. Use Cayley Hamilton theorem to find the inverse of the matrix

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

3. Solve the differential equation  $\frac{dy}{dx} = \frac{-(xy^3+y)}{2(x^2y^2+x+y^4)}$ .