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Total Number of Pages: 02

B.Tech  
BS1101

1<sup>th</sup> Semester Back Examination 2017-18

MATHEMATICS - I

BRANCH: AEIE, AERO, AUTO, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ETC,  
FASHION, IEE, IT, MANUTECH, MECH, METTA, MINING, MME, PE, PLASTIC

Time: 3 Hours

Max Marks: 70

Q.CODE: B756

Answer Question No.1 which is compulsory and any five from the rest.  
The figures in the right hand margin indicate marks.

**Q1 Answer the following questions: (2 x 10)**

- Find the Radius of convergence of  $\sum_{n=1}^{\infty} \frac{x^{3n}}{8^n}$  ?
- Find the radius of curvature to the circle  $x^2 + y^2 = 16$  ?
- Find the integrating factor of  $2\cos y - \sin y \, dy = 0$  ?
- Define rank of the matrix?
- Write the differential equations whose solutions are  $e^x$  and  $e^{2x}$  ?
- Evaluate  $\binom{3}{2}$  ?
- Prove that product of two unitary matrix is unitary?
- Find the General solutions of  $(D^2 - 1)y = 0$  ;  $D = \frac{d}{dx}$  ?
- Check whether the vector  $(1, 2, 0)$ ,  $(1, 1, 1)$ ,  $(2, 2, 2)$  and  $(0, 0, 0)$  are Linearly independent or linearly dependent?
- Find Asymptotes parallel to both the axis of the curve  $y^3x + x^4 + 2xy + 1 = 0$

**Q2 a)** Find the radius of curvature at any point  $x = \frac{\pi}{4}$  of the curve  $y = 4\sin 2x - \sin 4x$  ? **(5)**

**b)** Find all asymptotes of the curve  $x^2 + 3xy + 2y^2 + 3x - 2y + 1 = 0$  ? **(5)**

**Q3 a)** Prove the Rodrigue's formula ? **(5)**

**b)** Prove that  $J_{-0.5}(x) = \sqrt{\frac{2}{\pi x}} \cos x$  ,  $j_n(x)$  be the Bessel's functions **(5)**

**Q4 a)** Solve  $\frac{dy}{dx} + \frac{y}{x} = \frac{y^2}{x} \log x$  **(5)**

**b)** Solve the initial value problem  $\frac{dy}{dx} + y \cos x = \sin 2x, y(\pi) = 0$  **(5)**

**Q5 a)** By using method of undetermined coefficient solve  $(D^2 - 3D + 2)y = e^x + e^{2x}$  ;  $D = \frac{d}{dx}$  ? **(5)**

**b)** Solve  $y'' - 4y' + 5y = e^x \operatorname{cosec} x$  by method of variation of the parameter? **(5)**

**Q6 a)** Find the rank of the matrix  $A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 4 & 4 \\ -3 & 4 & 4 \end{bmatrix}$  ? **(5)**

**b)** Solve the system of linear equations  $4y + 3z = 8$  ,  $2x - z = 2$  ,  $3x + 2y = 5$  by Gauss elimination method? **(5)**

**Q7 a)** Diagonalize the matrix  $P = \begin{bmatrix} 2 & 1 \\ 2 & 1 \end{bmatrix}$  **(5)**

**b)** Find the type of conic section represented by the quadratic form  $4x^2 + 12xy + 13y^2 = 16$  ? **(5)**

**Q8 a)** Solve the initial value problem  $x^2y'' - xy' + y = \ln x$  ,  $y(1) = 3$  ,  $y'(1) = 0$  ? **(5)**

**b)** Prove that the eigenvalues of a hermitian matrix are real ? **(5)**