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Total No. of Questions: 09

# B.Tech.(2010 Batch) (Sem. - 2) ENGINEERING MATHEMATICS - II <br> M Code: 54002 <br> Subject Code: AM-102 <br> Paper ID: [A0119] 

Time: 3 Hrs.
Max. Marks: 60

## INSTRUCTIONS TO CANDIDATES:

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B \& C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B \& C carrying EIGHT marks each.
4. Select at least TWO questions from SECTION - B \& C.

## SECTION A

1. a) Examine whether vectors $(2,2,1),(1,-1,1),(1,0,1)$ are linear independent or not.
b) Show that the eigen values of Hermitian matrix are real.
c) Obtain general solution of differential equation $y=x y^{\prime}+\left(y^{\prime}\right)^{2}$
d) Find the solution of $x y^{\prime}+y=y^{2}$
e) Find a unit normal vector to the surface $x y^{2}+2 y z=8$ at point $(3,-2,1)$
f) State Gauss Divergence theorem. Find divergence of vector field

$$
\mathrm{V}=\left(x^{2} y^{2}-z^{3}\right) \hat{l}+2 x y z \hat{j}+e^{\mathrm{xyz}} \hat{\mathrm{k}}
$$

g) A can solve $90 \%$ of problems given in book and B can solve $75 \%$. What is the probability that at least one of them will solve problem selected at random.
h) Give applications of Chi-square distribution.
i) Find homogenous linear differential equation whose particular solution is $5+e^{\mathrm{x}}+2 e^{3 \mathrm{x}}$
j) A particle is executing S.H.M with amplitude 20 cm and time 4 seconds. Find the time required by particle in passing between points which are at distance 15 cm and 5 cm from the centre of force and are on same side of it.

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## SECTION B

2. Show that the matrix $A=\left[\begin{array}{ccc}3 & 1 & -1 \\ -2 & 1 & 2 \\ 0 & 1 & 2\end{array}\right]$ is diagonalizable. Hence find P such that $\mathrm{P}^{-1} \mathrm{AP}$ is diagonal matrix. Then obtain the matrix $B=A^{2}+5 A+3 I$
3. Solve the differential equation $\left(2 x y+x^{2}\right) y^{\prime}=3 y^{2}+2 x y$
4. Solve $x^{3} y^{\prime \prime \prime}-3 x^{2} y^{\prime \prime}+7 x y^{\prime}-8 y=3 x^{3}+8 x$
5. A constant electromotive force $E$ volts is applied to circuit containing constant resistance $R$ ohms in series and constant inductance $L$ henries. If initial current is zero show that current builds up to half its theoretical maximum in $(\mathrm{L} \log 2) / \mathrm{R}$ seconds.

## SECTION C

6. Give physical interpretation of Curl.
7. Evaluate $\oint 2 y^{3} d x+x^{3} d y+z d z$ over the curve where curve is trace of cone $z=\sqrt{x^{2}+y^{2}}$ intersected by the plane $z=4$ and $S$ is the surface of cone below $Z=4$.
8. a) The random variable $X$ is normally distributed with mean $=9$ and standard deviation $=3$. Find the probabilities i) $\mathrm{X} \geq 15$
ii) $\mathrm{X} \leq 15$ iii) $0 \leq \mathrm{X} \leq 9$
b) Find the moment generating function of Poisson distribution.
9. a) Test the hypothesis that $\sigma=20$, given that $\mathrm{s}=30$ for a random sample of size 80 from a normal population.
b) The number of students in a class is 100 . The average marks scored by 64 boys is 66 with standard deviation of 10 while the average marks scored by 36 girls is 70 with standard deviation of 8 . Test at $1 \%$ level of significance whether the girls perform better than boys.
