*Total No. of Questions : 8]* *[Total No. of Printed Pages : 2*

**Roll No** .....

# BE-102

## B.E. I & II Semester

Examination, December 2016

## Engineering Mathematics-I

***Time : Three Hours***

***Maximum Marks : 70***

***Note:*** Attempt any five questions out of eight questions. All questions carry equal marks.

1. a) Find the Maclaurin's expansion of $f(x)=\log(1+x)$.

   b) Find maxima and minima of the function $x^3-4xy+2y^2$.

2. a) Find the curvature at the point '$t$' on the curve $x=a\cos t$, $y=a\sin t$.

   b) If $u(x,y)=\tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$, then prove that

   $$x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\sin 2u.$$

3. a) Define integral as limit of sum and use the definition to evaluate the integral $\int_a^b x\,dx$.

   b) Evaluate $\int_2^4\int_2^1\left(x^2+y^2\right)dx\,dy$

4. a) Express the integral $\int_0^1 x^4(1-x)^3\,dx$ in terms of gamma function and evaluate it.

   b) Evaluate the triple integral $\int_0^1\int_1^2\int_2^3 xyz\,dxdydz$.







5. a) Solve $\left(D^2-3D+2\right)y=e^{2x}$.

   b) Solve the Cauchy's homogeneous differential equation :

   $$x^2\frac{d^2y}{dx^2}-x\frac{dy}{dx}+y=2\log x$$

6. a) Find the rank of the matrix $A=\begin{pmatrix}1&2&3\\1&4&2\\2&6&5\end{pmatrix}$.

   b) Find Eigen values and Eigen vectors of the matrix

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

7. a) Make the truth table of $(\sim p)\wedge(\sim q)$. Find whether it is a tautology or not.

   b) Write a short note on the followings :
   i) Graph,
   ii) Connected graph,
   iii) Circuit,
   iv) Complete graph,
   v) Spanning tree.

8. a) Draw the switching circuit for the function $F(x,y)=(x\cdot y)+(x\cdot y')+(x'\cdot y')$ and replace it by simpler one.

   b) Show that the total number of edges in a complete graphs with $n$-vertices is $\frac{n(n-1)}{2}$

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