OR

Verify Cayley - Hamilton theorem for the matrix.

$$A=\begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}.$$ Hence compute A^{-1}.

Unit - V

5. a) Define the following with examples :
   i) Union of two fuzzy set
   ii) Intersection of two fuzzy set
   b) Define the following:
   i) Simple graph ii) Multigraph
   iii) Degree of vertex iv) Isolated vertex
   c) Prove that the number of vertices of odd degree in a graph is always even.
   d) If (B, +, •, ') be a Boolean algebra and a, b be any two elements of B. Then show that $(a+b)' = a'.b' \ \forall \ a, b \in B$.

OR

Write the function $f(x, y, z) = x.y' + x.z + x.y$ into conjunctive normal form in three variables.

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Roll No .....

BE - 102

B.E. I & II Semester

Examination, December 2015

Engineering Mathematics-I

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.
ii) All parts of each questions are to be attempted at one place.
iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.
iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a) Find the percentage error in the area of an ellipse if 1% error is made in measuring the major and minor axes.
   b) Discuss the maxima and minima of the function x^3+y^3-3axy
   c) Find the radius of curvature at any point of the curve $x = a\cos t, y = b\sin t$
   d) Use Taylor's theorem to prove that

$$\tan^{-1}(x+h)=\tan^{-1}x+(h\sin\theta).\frac{\sin\theta}{1}-(h\sin\theta)^2\frac{\sin 2\theta}{2}$$

$$+(h\sin\theta)^3\frac{\sin 3\theta}{3}-.....+(-1)^{n-1}(\text{hsin}\theta)^n\frac{\sin n\theta}{n}+....$$

Where $\theta=\cot^{-1}x$.

OR

Expand $e^{x\cos x}$ by Maclaurin's theorem. **rgpvonline.com**

Unit - II

2. a) Find the limit when $n\to\infty$ of the series $\sum_{r=1}^{n}\frac{n^2}{(n^2+r^2)^{3/2}}$.

b) Evaluate $\int_0^1\left(\log\frac{1}{y}\right)^{n-1}dy$.

c) Change the order of integration in $\int_0^a\int_y^a\frac{x\,dx\,dy}{x^2+y^2}$ and hence evaluate the same.

d) Prove that $\beta(m,n)=\frac{\lfloor m\rfloor\lfloor n}{\lfloor(m+n)}, m>0, n>0$.

OR

Find the volume bounded by the paraboloid $x^2+4y^2+z=4$ and the xy-plane. Also sketch the curve.

Unit - III

3. a) Solve $(y\cos x+\sin y+y)dx+(\sin x+x\cos y+x)dy=0$

b) Solve $p^2+2py\cot x-y^2=0$.

c) Solve $(D^2+2D+1)y=x\cos x$.

d) Solve $x^2\frac{d^2y}{dx^2}+5x\frac{dy}{dx}+4y=x\log x$.

OR

Solve by the method of variation of parameters $\frac{d^2y}{dx^2}+y=\text{cosec}\,x$. **rgpvonline.com**

Unit - IV

4. a) Find the rank of the matrix A, where $A=\begin{pmatrix}2&1&-1\\0&3&-2\\2&4&-3\end{pmatrix}$. If λ be an eigen value of a non singular matrix A.

b) Show that λ^{-1} is an eigen value of A^{-1}.

c) Solve the equations:
$x_1+3x_2+2x_3=0,\ 2x_1-x_2+3x_3=0,\ 3x_1-5x_2+4x_3=0,$
$x_1+17x_2+4x_3=0.$

d) Find the eigen values and eigen vectors of the matrix.

$$A=\begin{pmatrix}-2&2&-3\\2&1&-6\\-1&-2&0\end{pmatrix}$$

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