Roll No .....

BE - 401

B.E. IV Semester Examination, December 2014

Mathematics - III

(Common for all Branches)

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 question 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.

1. a) Show that $w=e^z$ is an analytic function and determine $f'(z)$.

   b) Evaluate $\int_C \frac{z^2-z+1}{z-1}dz$, where C is the circle $|z|=1$.

   c) Evaluate $\int_C \frac{e^{2z}}{(z+1)^4}dz$, where C is the circle $|z|=2$.

   d) If $f(z)$ is a regular function of z prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^2=4|f'(z)|^2$.

   OR

   If $f(\xi)=\int_C \frac{3z^2+7z+1}{z-\xi}dz$, where C is the circle $x^2+y^2=4$, find the values of $f(3)$, $f'(1-i)$ and $f''(1-i)$.

2. a) Define algebraic and transcendental equations.
   b) Find the smallest positive root of the equation $x^3-2x+0.5=0$ by Newton-Raphson method.
   c) The equation $x^6-x^4-x^3-1=0$, has one real root between 1.4 and 1.5. Find the route to four decimal places by the method of False-Position.
   d) Solve the following system of equations $8x-y+z=18$; $2x+5y-2z=3$; $x+2y-3z=-6$ using Gauss-Seidel iterative method.

   OR

   Apply Gauss-Jordan method to find the solution of the following system of equations:
   $10x+y+z = 12$; $2x+10y+z = 13$, $x+y+5z = 7$.

3. a) Define interpolation and write the Newton's forward and Backward interpolation formula.
   b) Find the cubic polynomial which takes the following values:

x :	0	1	2	3
$f(x)$:	1	2	1	10

c) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Weddle's rule.

d) The following table gives the normal weights of babies during the first 12 months of life.

Age in months:	0	2	5	8	10	12
Weights in lbs:	7½	10¼	15	16	18	21

Estimate the weight of the baby at the age of 7 months.

OR

Find $f'(x)$ and $f''(x)$ at $x = 6$, given that

x :	4.5	5.0	5.5	6.0	6.5	7.0	7.5
$y = f(x)$:	9.69	12.90	16.71	21.18	26.37	32.34	39.15

4. a) Use Picards method to approximate y when $x = 0.1$ given that $y = 1$, when $x = 0$ and $\frac{dy}{dx} = \frac{y-x}{y+x}$.

b) Write the steps of Runge-Kutta method.

c) From the following data, obtain the value of the correlation coefficient: n = 10, Σx = 140, Σy = 150, $\Sigma (x-10)^2 = 180$, $\Sigma (y-15)^2 = 215$ and $\Sigma (x-10)(y-15) = 60$.

d) By the method of least squares, find the curve $y = ax+bx^2$, that best fits the following data:

x :	1	2	3	4	5
y :	1.8	5.1	8.9	14.1	19.8

OR

Given $\frac{dy}{dx} = 1 + \frac{y}{x}$, $y = 2$ at $x = 1$. Find approximate value of y at $x = 1.4$ by taking step size $h = 0.2$, apply modified Euler's method.

5. a) Find the mean of the binomial distribution.

b) Given A and B two events with $P(A \cup B) = \frac{7}{8}, P(A \cap B) = \frac{1}{4}$ and $P(A \cap \bar{B}) = \frac{5}{8}$. Find $P(A)$ and $P(B)$.

c) If the probability of a bad reaction from certain injection is 0.001. Determine the chance that out of 2000 individuals more than two will get a bad reaction.

d) Fit a Poisson distribution for the following data and test the goodness of fit, given that $\chi^2 = 0.05 = 7.815$ for 3 d.f.

x :	0	1	2	3	4
f :	122	60	15	2	1

OR

The life time of a certain kind of battery is a random variable, which as an exponential distribution with a mean of 200 hrs. Find the probability that such a battery will last. (i) At most 100 hrs. and (ii) last any-where from 400 to 600 hrs.

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