3rd Semester Regular Examination 2018-19
APPLIED MATHEMATICS
BRANCH : MECH
Time : 3 Hours
Max Marks : 100
Q.CODE : E982
Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1   **Short Answer Type Questions (Answer All-10)**   **(2 x 10)**
a)   What is the method of separating variables as a method of getting solution of partial differential equation? Give an example.
b)   Find the Taylor series of $f(z) = \frac{1}{z}$ at z=1.
c)   The Residue of $f(z) = \frac{1}{(z-1)(z-2)}$ at z=3.
d)   Solve the partial differential equation $u_{xy} + u_y = 0$
e)   By what physical law did we obtain the equation of the vibrating string? What is the name of the equation?
f)   A fair coin is tossed 400 times. If X is the number of heads obtained, find the expected value and variance of X.
g)   A book has four misprints per page (on average), what is the probability that a page open at random will have no misprints on it?
h)   Define type-I and type-II error in hypothesis testing.
i)   Express Laplace Equation in Polar co-ordinates.
j)   Find the mean and variance of Binomial Distribution.

Part- II

Q2   **Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   **(6 x 8)**
a)   Verify z^6 is analytic or not.
b)   Evaluate the integral: $\int_{-\infty}^{\infty} \frac{x^3}{(1+x^8)} dx$
c)   Using Residue theorem, evaluate the following integral $\oint_c \frac{z-23}{z^2-4z-5} dz, \ c:|z-2| = 4$.
d)   Solve: $x(r + 2xs + x^2 t) = p + 2x^3$ by Monge's method
e)   Derive the solution of Heat equation for the bar with insulated ends using variable separable method.
f)   In a sample of 8 observations, the sum of squared deviation of items from the mean was 94.5. In other sample of 10 observations, the value was found by 101.7. Test whether the difference is significant at 5% level of significance?
g)   Define Cauchy-Riemann equation and determine the value of **a** and **b** such that the given function $u = ax^3 + by^3$ is Harmonic and find Harmonic conjugate.
h)   Find the McLaurin's series expansion and also find the Radius of convergence $\cos 2z^2$
i)   Check the nature of singularity of the following function:

  (i) $f(z) = \frac{\cos z - \sin z}{z^2}$ (ii) $f(z) = e^{\frac{1}{z}}$.

j) Transform the equation $u_{xx} + 6u_{xy} + 9u_{yy} = 0$ to normal form using suitable transform and solve it.

k) A function defined as follows :

$$f(x) = \begin{cases} 0 & x < 1 \\ \dfrac{2}{7}(x+2) & 1 < x < 2 \\ 0 & x > 2 \end{cases}$$

(i) Show that it is a density function.
(ii) Find the expectation and variance.
(iii) Find the distribution function.

l) In a certain Factory turning out razor blades there is a small chance of 0.002 for any blade to be defective. The blades are supplied in packets of 10. Calculates approximate number of packets containing:
(i) no defective (ii) one defective (iii) two defective blades in a consignment of 10,000 packets.

Part-III
Long Answer Type Questions (Answer Any Two out of Four)

Q3 Find all Taylor and Laurent Series of $f(z) = \dfrac{-2z+3}{z^2 - 3z + 2}$ with center zero. **(16)**

Q4 a) 2% of the fuses manufactured by a farm are found to be defective, find the probability that a box containing 200 fuses contains **(8)**
    (i) no defective
    (ii) three or more defectives

b) The probability of a man hitting a target is ¼. How many times must he fire so that the probability of his hitting the target at least once is greater than 2/3 ? **(8)**

Q5 a) Evaluate the integral: $\int_0^{2\pi} \frac{1+sin\theta \; d\theta}{3+cos\theta}$. **(8)**

b) State and prove D-Alembert's solutions of wave equation. **(8)**

Q6 By using Least square method for the following data, find out **(16)**
    a)   Regression line of y on x
    b)   Regression line of x on y
    c)   Fit a parabola $y = ax^2 + bx + c$

x	:	1	2	3	4	5
y	:	2	5	3	8	7