Please check that this question paper contains 09 questions and 02 printed pages within first ten minutes.

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[Total No. of Questions: 09]
Uni. Roll No. ....

[Total No. of Pages: 02]

Program: B.Tech. (Batch 2018 onward)
Semester: 3
Name of Subject: Engineering Mathematics-III
Subject Code: BSEC-101
Paper ID: 16030
Scientific calculator is Not Allowed

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

Part – A **[Marks: 02 each]**

Q1.

a) Define Billinear Transformation.

b) Classify the equation $u_{xx} - 2u_{xy} + u_{yy} = 0$.

c) What is the inverse Laplace transform of $\frac{1}{(p-1)^2}$?.

d) Find the particular integral of $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin(2x+3y)$.

e) Show that $P_n(1) = 1$.

f) Using Cauchy Integral formula, Evaluate $\oint_C \frac{e^z}{z(z+1)} dz$, where C is the circle $|z| = \frac{1}{4}$.

Part – B **[Marks: 04 each]**

Q2. Find a basis and dimension of the subspace W of R^4 generated by the vectors $(1,-4,-2,1), (1,-3,-1,2), (3,-8,-2,7)$.

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Q3. Solve the equation $y^2 p - xyq = x(z - 2y)$.

Q4. Find the Laplace transform of $\frac{1 - \cos 2t}{t}$.

Q5. Find all the values of $\left(\frac{1}{2} + \frac{\sqrt{3}}{2} i\right)^{3/4}$.

Q6. Prove that $xJ_n' = -nJ_n + xJ_{n-1}$.

Q7. Expand $\frac{1}{(z+1)(z+3)}$ in the regions

(i) $1 < |z| < 3$ (ii) $1 < |z+1| < 2$

Part – C **[Marks: 12 each]**

Q8. Using Laplace transform, Solve the differential equation $\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + 5x = e^{-t} \sin t$ where $x(0) = 0$ and $x'(0) = 1$.

OR

State and Prove De-Moivre's Theorem.

Q9. A tightly stretched flexible string has its ends fixed at $x = 0$ and $x = l$. At time $t = 0$ the string is given a shape defined by $F(x) = \mu x(l - x)$, μ is a constant and then released. Find the displacement $y(x,t)$ of any point x of the string at any time $t > 0$.

OR

Solve in series the equation $2x^2 \frac{d^2y}{dx^2} + (2x^2 - x)\frac{dy}{dx} + y = 0$.

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