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THIRD SEMESTER **B.Tech. [EP]**

SUPPLEMENTARY EXAMINATION ***February-2018***

EP-203: MATHEMATICAL PHYSICS

Time: 3.00 Hours ***Max. Marks: 50***

Note :	Answer any **FIVE** questions. Assume suitable missing data, if any.

1.[a] State and prove Stoke's theorem in vector analysis **(7)**

[b] Find the work done by the force $\vec{f} = (2y+3)\,\hat{\imath} + xz\,\hat{\jmath} + (yz - x)\hat{k}$, when it moves a particle from the point (0,0,0) to the point (2,1,1) along the curve $x = 2t^2$, $y = t$ and $z = t^3$. **(3)**

2. Define piezoelectric effect and converse piezoelectric effect. Discuss the Application of tensor analysis to the piezoelectricity and converse piezoelectricity. **(10)**

3. [a] State and prove the Cauchy-Riemann equations for a function of a complex variable to be analytic. **(6)**

[b] Find the residues of $f(z) = \frac{ze^z}{(z-a)^3}$ at z=a. **(4)**

4. A thin rectangular plate whose surface is impervious to heat flow has arbitrary distribution of temperature f(x,y) at t=0. Its four edges x=0, x=a, y=0 and y=b are kept at zero temperature. Determine the subsequent temperature of the plate after time 't'. **(10)**

5. [a] Apply Runge-Kutta method to the equation $y' = x + y, y\,(0) = 1$ to determine x= 0.1 and 0.2 correct to four decimal places. **(6)**

[b] Calculate the approximate value of $\sin x$ for $x = 0.54$ using the following table: **(4)**

x	0.5	0.7	0.9	1.1	1.3	1.5
$\sin x$	0.47943	0.64422	0.78333	0.89121	0.96356	0.99749

6. Answer any ***four*** of the following: **(4×2.5 = 10)**

[a] Define Kronecker delta and prove that (a) $\delta^j_k a^j = a^k$.

[b] Find div$\vec{f}$, where $\vec{f} = grad\,(x^3 + y^3 + z^3 - 3xyz)$.

[c] Define Pole and residue of pole

[d] Prove that (i) $E^{-1} = 1-\nabla$ (ii) $(1-\Delta)(1-\nabla) = 1$

[e] Separate Log (1+i) in to real and imaginary parts.