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Total No. of Pages: 02  
Total No. of Questions: 09

**B.TECH. BIOMEDICAL ENGG. (Sem.-3<sup>rd</sup>)**

**ENGG.MATHEMATICS**

**Subject Code: AM-201**

**Paper ID: [A0303]**

**Time: 3 Hrs.**

**Max. Marks: 60**

**INSTRUCTIONS TO CANDIDATE:**

- (i) Section –A, is Compulsory. Consisting of ten questions carrying two marks each.
- (ii) Attempt any five questions from Section-B. Five marks each and students has to attempt any Four question.
- (iii) Attempt any three questions from Section-C. Carrying Ten marks each and students has to attempt any two question.

**Section –A**

**(10x2=20)**

- Q.1.(a)** What is the Euler's formula for Fourier series expansion?
- (b) What is one dimensional and two dimensional heat equation?
- (c) Find cosine series for  $f(x) = \sin x$ ,  $0 < x < \pi$ .
- (d) Show that  $\frac{d}{dx}[x^v J_v(x)] = x^v J_{v-1}(x)$
- (e) What are Cauchy- Riemann equations for analytic function?
- (f) What is conformal mapping?
- (g) Define pole and residue in complex number.
- (h) Write the formula used in Laplace transform of derivative.
- (i) Define impulse function.
- (j) Define odd and even function.

**Section –B**

**(4x5=20)**

**Q.2.** Solve  $x^2 \frac{\partial u}{\partial x} + y^2 \frac{\partial u}{\partial y} = 0$  by the method of separation of variables.

**Q.3.** Find the Fourier series of  $x - X^2$  from  $x = \pi$  to  $x = \pi$ .

**Q.4.** Find Laplace transform of  $e^{-3t} (2\cos 5t - 3\sin 5t)$

Q.5. Show that .  $\frac{d}{dx} [x^{-n} J_n(x)] = -x^{-n} J_{n+1}(x).$

Q.6. Evaluate  $\oint_C \frac{dz}{z^2+9}$ , where  $C$  is

(a)  $|z-3i|=4$  (b)  $|z+3i|=2$

**Section -C**

**(2x10=20)**

Q.7. The wave equation  $\frac{\partial^2 u}{\partial t^2} + c^2 \frac{\partial^2 u}{\partial x^2}$  representing the vibration of a string of length  $\ell$ , fixed at both ends, given that  $u(0, t) = 0$ ,  $u(\ell, t) = 0$ ,  $u(x, t) = f(x)$  and  $\frac{\partial u(x, 0)}{\partial t} = 0$ ,  $0 < x < \ell$ . Find displacement at any point on the string.

Q.8. Find the residues of  $f(z) = \frac{z^3}{(z-1)^4(z-2)(z-3)}$  at its pole and hence evaluate  $\oint_C f(z) dz$ , where  $C$  is a circle  $|z| = 5/2$ .

Q.9.

(a) Express  $f(x) = x$  as a half range cosine series in  $(0, 2)$ .

(b) Show that  $P_4(x) = \frac{1}{8}(35x^4 - 30x^2 + 3)$ .

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