

**College of Engineering, Pune**  
(An Autonomous Institute of Government of Maharashtra)

**END SEMESTER EXAMINATION**  
**(AS105) Engineering Mathematics - II**

Programme: F.Y.B.TECH.  
Year: 2009-10  
Duration: 3Hrs.

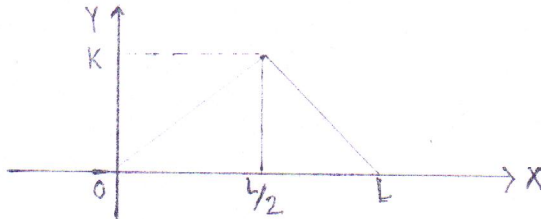
Branch: All  
Semester: II  
Max. Marks: 50

Instructions:

- (1) ALL Questions are compulsory.
- (2) Figures to the right indicate full marks.
- (3) Draw neat figures wherever required.

Q.I Answer any TWO sub-questions. 10

- A Find the Fourier series of  $f(x) = 3x^2$  for  $x \in (-1,1)$ .
- B Find the half range Fourier cosine expansion of  $f(x) = \pi - x$  ;  $0 < x < \pi$  .
- C Find half range Fourier Sine expansion for the following function



Q. II Answer any TWO sub-questions. 10

- A Show that  $\int_0^{\pi/2} \sqrt{\tan \theta} d\theta = \frac{\pi\sqrt{2}}{2}$ .
- B The Bessel function of integral order is defined as  $J_n(x) = \frac{1}{\pi} \int_0^{\pi} \cos(nt - x \sin t) dt$  ; show that  $\frac{d}{dx} J_n(x) = \frac{1}{2} [J_{n-1}(x) - J_{n+1}(x)]$  where  $x$  is parameter.
- C Evaluate  $\int_0^1 x^{\alpha-1} \left(\log \frac{1}{x}\right)^{n-1} dx$

Q. III Answer any TWO sub-questions. 10

- A Trace the curve  $r^2 = a^2 \cos 2\theta$  .
- B Change the order of integration  $\int_0^{a \cos \alpha} \int_{x \tan \alpha}^{\sqrt{a^2 - x^2}} f(x, y) dx dy$  .

C Express the following integral in polar co-ordinates and

evaluate  $\int_0^a \int_{\sqrt{ax-x^2}}^{\sqrt{a^2-x^2}} \frac{dx dy}{\sqrt{a^2-x^2-y^2}}$ .

Q. IV

Answer any TWO sub-questions.

10

A Evaluate  $\iiint_V z^2 dv$  Where  $v$  is the portion of sphere  $z = \sqrt{a^2 - r^2}$

which lies within the cylinder  $x^2 + y^2 = ax$ .

B Find root mean square value of distances from origin of points within  $x^2 + y^2 = ax$  cut off by  $x = a$  where  $x \geq a$ .

C Find the area of the region bounded by the curves  $xy = 4, xy = 8, xy^3 = 5, xy^3 = 15$ .

Q. V

Answer any TWO sub-questions.

10

A Solve the differential equation  $(D^2 + 4D + 5)y = -2 \cosh x$

B Solve the differential equation  $(\cos x - x \cos y)dy - (\sin y + y \sin x)dx = 0$ .

C Solve the differential equation

$$(1 + 2e^{x/y}) + 2e^{x/y} \left(1 - \frac{x}{y}\right) \frac{dy}{dx} = 0$$