Exam No: ___________

GANPAT UNIVERSITY

B. TECH SEM- III(Civil)(CBCS)(New) REGULAR EXAMINATION– NOV-DEC 2016

2HS305 Mathematics for Civil Engineering

TIME: 3 HRS **TOTAL MARKS: 60**

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.

(2) Figures on right indicate marks.

(3) Be precise and to the point in answering the descriptive questions.

SECTION: I

Q.1 Answer the following

(a) Using convolution theorem evaluate $L^{-1}\left(\frac{1}{s^4-2s^3}\right)$ **4**

(b) Evaluate $L^{-1}\left(log\left(\frac{s^2+1}{s(s+1)}\right)\right)$ **3**

(c) Evaluate $L\left\{\frac{cos\ at-cos\ bt}{t}\right\}$ **3**

OR

Q.1 Answer the following

(a) Evaluate $L^{-1}\left(\frac{s^2-6s+4}{s^3-3s^2+2s}\right)$ **4**

(b) Find Laplace transform of $f(t)=\begin{cases} e^t, 0\le t<5 \\ 3, \quad\quad t\ge 5\end{cases}$ **3**

(c) Solve $y''-4y'+5y=0, y(0)=1, y'(0)=2$, using Laplace transform. **3**

Q.2 Answer the following

(a) Expand x^2 in Fourier series in the interval $-\pi\le x\le\pi$. Hence deduce that $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\dots=\frac{\pi^2}{12}$ **4**

(b) Find Fourier series of $f(x)=xsin\,x$ in $-\pi\le x\le\pi$ **3**

(c) Obtain half rang cosine series for $f(x)=x(\pi-x), x\in[0,\pi]$. **3**

OR

Q.2 Answer the following

(a) Find Fourier series for $|sin\, x|, -\pi < x < \pi$. **5**

(b) If $f(x) = \frac{(\pi-x)^2}{4}, 0 < x < 2\pi$, show that $f(x) = \frac{\pi^2}{12} + \sum_{n=1}^{\infty}\left(\frac{\cos nx}{n^2}\right)$ **5**

Q.3

(a) Find Fourier series for $f(x) = \begin{cases} x + \frac{\pi}{2}, -\pi < x < 0 \\ \frac{\pi}{2} - x, 0 < x < \pi \end{cases}$. Hence deduce that $1 + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\pi^2}{8}$ **4**

(b) **Attempt any two** **6**

I Evaluate $L(t\, cos(4t + 3))$

II Evaluate $L^{-1}\left(\frac{3s+9}{s^2+2s+10}\right)$

III Find half range cosine series of $e^x, 0 < x < l$.

SECTION: II

Q.4 Answer the following

(a) Using method of variation of parameter solve: $(D^2 + 2D + 1)y = e^{-x} \ln x$ where $D = \frac{d}{dx}$ **4**

(b) Solve: $(D^3 + 1)y = e^{-x}$ where $D = \frac{d}{dx}$ **3**

(c) Solve: $(D^2 - 1)y = e^{2x} \cos 3x$ where $D = \frac{d}{dx}$ **3**

OR

Q.4 Answer the following

(a) Solve simultaneous equations $\frac{dx}{dt} = y + 1, \frac{dy}{dt} = x + 1$ **4**

(b) Solve Cauchy homogeneous differential equation $x^2\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} - 4y = x^4$ **3**

(c) Solve: $(3D + 1)^2 y = 5e^{-\frac{x}{3}}$ where $D = \frac{d}{dx}$ **3**

Q.5 Answer the following

(a) Form a partial differential equation by eliminating arbitrary constant or function from **4**

(I)$z = f(x^2 - y^2)$ and (II)$z = (x + a)(y + b)$

(b) Solve $\frac{\partial^2 z}{\partial x \partial y} = x^3 + y^3$ by direct integration. 3

(c) Solve $(y^2 + z^2)p - xyq - xz = 0$ 3

OR

Q.5 Answer the following

(a) Solve $x^2p + y^2q = z(x + y)$ 4

(b) Using method of separation of variables, solve $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 2(x + y)u$ 3

(c) Solve $\frac{\partial^3 z}{\partial x^2 \partial y} = \cos(2x + 3y)$ by direct integration. 3

Q.6

(a) Solve $yq - xp = z$ 4

(b) **Attempt any two** 6

I A husband and wife appear in an interview for two vacancies in the same post. The probability of husband's selection is 1/7 and that of wife's selection is 1/5. What is the probability that (i) both of them will be selected (ii) none of them will be selected.

II A box contains 3 white and 4 black balls. Another box contains 2 white and 3 black balls. A box is selected at random and then a ball is drawn from it. What is the probability that the ball drawn is a white one?

III Solve $\frac{d^2y}{dx^2} - 4y = 2\cosh x$