b) Find the directional derivative of $\phi = xy + yz + zx$ in the direction of the vector $i + 2j + 2k$ at the point (1,2,0).

c) If $r = xi + yj + zk$ then show that grad $r^n = nr^{n-2}r$.

d) Varify Stoke's theorem for $F = (x^2 + y^2)i - 2xyj$ taken round the rectangle bounded by $x = \pm a, y = 0, y = b$.

OR

Prove that div. grad $r^m = \nabla \cdot \nabla r^m = m(m+1)r^{m-2}$

******

Total No. of Questions :5]

Roll No ....

BE - 301

B.E. III Semester

Examination, June 2015

Engineering Mathematics - II

(Common for all Branches)

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each questions are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

UNIT - I

1. a) What is periodic function, give an example of periodic function?

b) What are the dirichlet's condition for a Fourier expansion?

c) Find the Fourier transform of e^{-ax^2}, where $a > 0$.

d) Expand $f(x) = x\sin x$, $0 < x < 2\pi$ in a Fourier series.

OR

Express $f(x) = x$ as a

i) Half range cosine series in $0 < x < 2$

ii) Half range sine series in $0 < x < 2$

UNIT - II

2. a) Find $L\{2\sin t \cos t\}$.

b) Write the Linearly property of Laplace Transform.

c) Find the Laplace Transform of $f(t)$,

where $f(t) = \begin{cases} 2, & 0 \le t \le 2 \\ t-1, & 2 \le t \le 3 \\ 7, & t > 3 \end{cases}$

d) Evaluate $L^{-1}\left\{\dfrac{6s^2+22s+16}{s^3+6s^2+11s+6}\right\}$.

OR

Using Convolution Theorem, Evaluate $L^{-1}\left\{\dfrac{s}{(s^2+a^2)^2}\right\}$.

UNIT - III

3. a) Explain the ordinary point and singular point of differential equation.

b) Give the complete solution of differential equation when the roots of indicial equations are equal.

c) Solve the differential equation

$$\frac{d^2y}{dx^2} - 2\tan x\frac{dy}{dx} + 5y = \sec x . e^x$$

d) Solve $(1-x^2)\dfrac{d^2y}{dx^2} + 2x\dfrac{dy}{dx} + y = 0$ in series solution.

OR

Solve by method of variation of parameter $(D^2+1)y = x$.

UNIT - IV

4. a) Find the Partial differential equation by eliminating a and b from the relation $(x-a)^2+(y-b)^2 = z^2 - c$.

b) Solve $yzp + zxq = xy$.

c) Solve $\dfrac{\partial^2 z}{\partial x^2} + 2\dfrac{\partial^2 z}{\partial x \partial y} + \dfrac{\partial^2 z}{\partial y^2} = e^{3x+2y}$.

d) Solve by Charpits method $(p^2+q^2)y = qz$.

OR

Solve $\dfrac{\partial u}{\partial x} = 2\dfrac{\partial u}{\partial t} + u$ by the method of separation of variables. Where $u(x,0) = 6\,e^{-3x}$.

UNIT - V

5. a) If $u = t^2 i - tj + (2t+1)k$

$v = (2t-3)i + j - tk$

find $\dfrac{d}{dt}(u.v)$? at $t = 1$.