

- b) Find the directional derivative of  $\phi = xy + yz + zx$  in the direction of the vector  $i + 2j + 2k$  at the point  $(1, 2, 0)$ . [www.rgpvonline.in](http://www.rgpvonline.in)
- c) If  $r = xi + yj + zk$  then show that  $\text{grad } r^n = nr^{n-2}r$ .
- d) Verify 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  $\text{div. grad } r^m = \nabla \cdot \nabla r^m = m(m+1)r^{m-2}$

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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.

[2]

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OR

Express  $f(x) = x$  as ai) Half range cosine series in  $0 < x < 2$ ii) Half range sine series in  $0 < x < 2$ **UNIT - II**

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2. a) Find  $L\{2\sin t \cos t\}$ .  
 b) Write the Linearly property of Laplace Transform.  
 c) Find the Laplace Transform of  $f(t)$ ,

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

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

OR

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

**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.

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[3]

- c) Solve the differential equation

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

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

OR

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

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- 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  $\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = e^{3x+2y}$ .  
 d) Solve by Charpits method  $(p^2 + q^2)y = qz$ .

OR

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

**UNIT - V**

5. a) If  $u = t^2i - tj + (2t+1)k$   
 $v = (2t-3)i + j - tk$   
 find  $\frac{d}{dt}(u \cdot v)$  at  $t = 1$ .