Code No. 2002/BL

FACULTY OF ENGINEERING

B.E. I-Year (Backlog) Examination, October 2020

Subject : Mathematics – II

Time : 2 Hours **Max. Marks: 75**

PART- A

Answer any Seven question. **(7 x 3 = 21 Marks)**

1 Find the integrating factor of the differential equation
$(5x^3 + 12x^2 + 6y^2)dx + 6 = xy\, dy = 0$

2 Define Clairant's equation. Find the solution of $y = xy' + (y')^2$.

3 Solve the differential equation $y'' - 3y' - 2y = 0$.

4 Examine whether the following functions are linearly independent.
$2x, 6x + 3, 3x + 2$

5 Classify the singular points of the differential equation
$x^2y'' + (x + x^2)y' - y = 0$.

6 Find the power series solution about the origin of the differential equation $y' - 4y = 0$.

7 Show that $\text{erf}_c(-x) = 1 + \text{erf}(x)$.

8 Show that $P_n(-x) = (-1)^n P_n(x)$.

9 Find the laplace transform of $\cos^2 2t$.

10 Find the inverse Laplace transform of $\frac{s}{(s+3)^2 + 4}$.

PART- B

Answer any Three question. **(3x18 = 54 Marks)**

11 (a) Solve $(xe^{xy} + 2y)\frac{dy}{dx} + ye^{xy} = 0$.

(b) Solve $x^2\frac{dy}{dx} = e^y - x$.

12 (a) Find the general solution of the differential equation $\frac{dy}{dx} = y^2(2x-1)y + x^2 - x + 1$ if $y = x$ is a solution of the differential equation.

(b) Solve $\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$ by method of variation of parameters.

13 Find the series solution about $x = 0$ of the differential equation $x(1 + x)y'' + 3xy' + y = 0$.

14 (a) Show that $\beta(m,n) = \frac{\gamma_m \gamma_n}{\gamma_{m+n}}$

(b) Show that $J_4(x) = \left(\frac{48}{x^3} - \frac{8}{x}\right)J_1(x) + \left(1 - \frac{25}{x^2}\right)J_o(x)$.

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15 (a) Evaluate $L\left\{\int_0^t \frac{e^t \sin t}{t} dt\right\}$.

(b) Solve y′′ - 3y′ + 2y = 4t + e^{3t} when y(0) = 1 and y′(0)= -1. Using Laplace transforms.

16 (a) Solve $(D-2)^2 y = 8(e^{2x} + \sin 2x + x^2)$.

(b) Prove that $\int_0^\infty e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$.

17 (a) Apply convolution theorem to evaluate $L^{-1}\left(\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right)$.

(b) If 30% of a radioactive substance disappeared in 10 days, how long will it take for 90% it to disappear.

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Code No. 2503/CBCS/BL

FACULTY OF ENGINEERING

B. E. I - Semester (CBCS) (Backlog) Examination, October 2020

Subject: Engineering Mechanics - I

Time: 2 hours **Max. Marks: 70**

PART –A

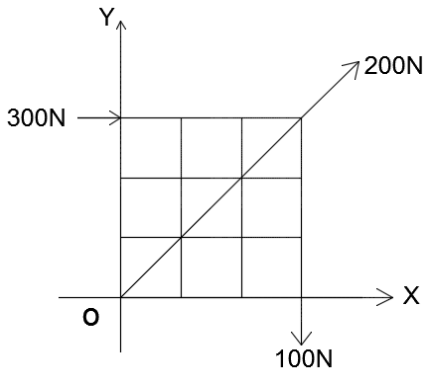
Note : Answer any Five Questions. **(5x2 = 10 Marks)**

1. Define Varignon's theorem.
2. List different type of forces
3. Define the term free body diagram with an example.
4. Name the different types of supports with sketches
5. What is belt friction and wedge friction
6. What is meant by deficient truss?
7. Define static and dynamic friction.
8. Find the centroid of a semicircular arc of radius 'R'.
9. What are the assumption made for analysis of trusses
10. State and prove perpendicular axis theorem.

PART-B

Note : Answer any Four Questions (4 x 15 = 60 Marks)

11. Three forces are shown in figure. Determine the resultant and its position with respect to X axis.



12. (a) A force of 100N acts from a point A(1,2,3) to another point (-2,3,5). Determine the amount of this force about a line passing through (3,2,4) and having direction cosines l = 0.62, m = 0.50, n = 0.60. (6M)

    (b) The X, Y, Z components of the force F are 18KN, 27KN, and 12KN respectively. Find the component of the force along the line joining A (1, 2,-3) B(-1,-2,2). (4M)

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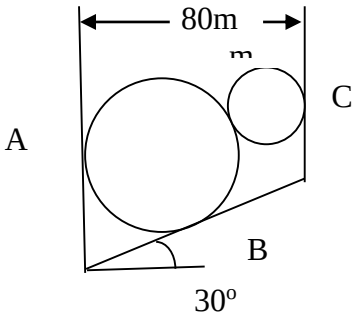
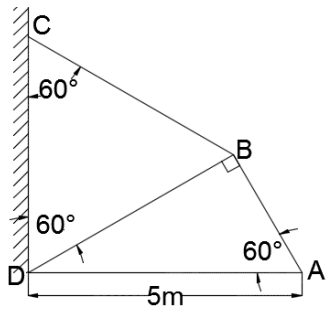
13. Two cylinders of diameters 60mm and 30mm weighing 160N and 40N respectively are placed as shown in figure. Assuming all the contact surfaces to be smooth, find the reactions at A, B and C. (10)

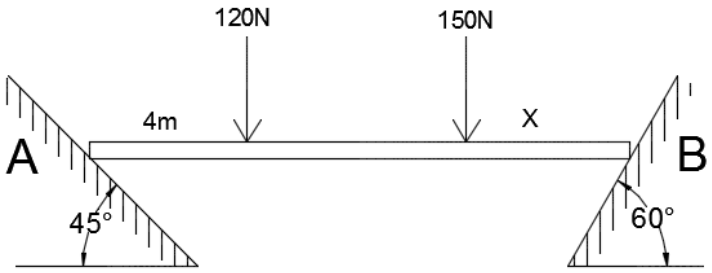


14. Find the magnitude and nature of force in the truss members as shown in the figure using method of joints. The load at joint 'A' is 30kN acting vertically downward.



15 Find the moment of inertia of a T-section of flange 40cm x 4cm with centrally placed web of 2cm x 15cm about its centroidal vertical axis.

16 A horizontal bar 12m long and of negligible weight rests on rough inclined planes with angle of friction as 15° as shown in figure. Compute the distance 'x' at which load 150N should be place from point 'B' to keep the bar horizontal.



17 Find the centroid of 'C'(channel) section of total height of 300mm,flanges100mm and thickness 20mm (both web & flange).

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