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III ME/CV

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10MAT31

Third Semester B.E. Degree Examination, June 2012
Engineering Mathematics – III

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions choosing atleast two from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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PART – A

1 a. Obtain the Fourier series for the function

$$f(x)=\begin{cases}1+\frac{2x}{\pi}, & -\pi\le x\le 0\\ 1-\frac{2x}{\pi}, & 0\le x\le \pi\end{cases}$$ and deduce $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots\ldots=\frac{\pi^2}{8}$. **(07 Marks)**

b. Find the half range cosine series for the function $f(x) = (x-1)^2$ in $0 < x < 1$ **(06 Marks)**

c. Obtain the constant term and the coefficient of the first sine and cosine terms in the Fourier expansion of y as given below. **(07 Marks)**

x	0	1	2	3	4	5
y	9	18	24	28	26	20

2 a. Express the function

$$f(x)=\begin{cases}1, & |x|\le 1\\ 0, & |x|>1\end{cases}$$ as a Fourier integral and hence evaluate $\int_0^\infty \frac{\sin x}{x}\,dx$. **(07 Marks)**

b. Find the sine and cosine transform of $f(x) = e^{-ax}$, $a > 0$ **(06 Marks)**

c. Find the inverse Fourier sine transform of $\frac{e^{-as}}{s}$. **(07 Marks)**

3 a. A tightly stretched string with fixed end points x = 0 and x = l is initially at rest in its equilibrium position. If it is vibrating giving to each of its points a velocity $\lambda x(l - x)$, find the displacement of the string at any distance x from one end and at any time t. **(07 Marks)**

b. Find the temperature in a thin metal bar of length 1 where both the ends ate insulated and the initial temperature in bar is $\sin \pi x$. **(07 Marks)**

c. Find the solution of Laplace equation, $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$, by the method of separation of variables. **(06 Marks)**

4 a. Fit a parabola $y = a + bx + cx^2$ to the following data: **(07 Marks)**

x	-3	-2	-1	0	1	2	3
y	4.63	2.11	0.67	0.09	0.63	2.15	4.58

b. A fertilizer company produces two products Naphtha and Urea. The company gets a profit of Rs.50 per unit product of naphtha and Rs.60 per unit product of urea. The time requirements for each product and total time available in each plant are as follows:

Plant	Hours required		Available hours
	Naphtha	Urea	
A	2	3	1500
B	3	2	1500

The demand for product is limited to 400 units. Formulate the LPP and solve it graphically. **(06 Marks)**

c. Solve the following using Simplex method:
Maximize $Z = x_1 + 4x_2$
Subject to constraints $-x_1 + 2x_2 \le 6$; $5x_1 + 4x_2 \le 40$; $x_j \ge 0$. **(07 Marks)**

PART – B

5 a. Use Regula-falsi method to find a root of the equation $2x - \log_{10}x = 7$ which lies between 3.5 and 4. **(06 Marks)**

b. Solve by relaxation method.

$10x - 2y - 2z = 6$; $-x + 10y - 2z = 7$; $-x - y + 10z = 8$ **(07 Marks)**

c. Use the power method to find the dominant eigenvalue and the corresponding eigenvector of the matrix $A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ with the initial eigenvector as $[1\ \ 1\ \ 1]^T$. **(07 Marks)**

6 a. The following data is on melting point of an alloy of lead and zinc where t is the temperature in Celsius and P is the percentage of lead in the alloy, tabulated for P = 40(10)90 (i.e., P from 40 to 90 at intervals of 10). Find the melting point of the alloy containing 86% of lead.

P	40	50	60	70	80	90
t	180	204	226	250	276	304

(07 Marks)

b. Using Lagrange's formula, find the interpolation polynomial that approximates to the functions described by the following table:

x	0	1	2	5
f(x)	2	3	12	147

and hence find f(3). **(07 Marks)**

c. Evaluate $\int_0^5 \frac{dx}{4x+5}$, by using Simpson's $\frac{1}{3}^{rd}$ rule, taking 10 equal parts. Hence find log 5. **(06 Marks)**

7 a. Solve the partial differential equation

$$\frac{\partial^2 U}{\partial x^2} + \frac{\partial^2 U}{\partial y^2} = -10\left(x^2 + y^2 + 10\right)$$

over the square with side x = 0, y = 0, x = 3, y = 3 with u_0 on the boundary and mesh length h = 1. **(07 Marks)**

b. Solve the heat equation $\frac{\partial U}{\partial t} = \frac{\partial^2 U}{\partial x^2}$, subject to the conditions

$U(0, t) = u(1, t) = 0$ and $u(x,0) = \begin{cases} 2x & \text{for } 0 \le x \le 1/2 \\ 2(1-x) & \text{for } 1/2 \le x \le 1 \end{cases}$

Taking h = 1/4 and according to Bender Schmidt equation. **(06 Marks)**

c. Evaluate the pivotal values of the equation $u_{tt} = 16\, u_{xx}$ taking h = 1 upto t = 1.25. The boundary conditions are u(0, t) = u(5, t) = 0, $u_t(x, 0) = 0$ and $u(x, 0) = x^2(5 - x)$. **(07 Marks)**

8 a. If $U(z) = \frac{2z^2 + 5z + 14}{(z-1)^4}$, evaluate u_2 and u_3. **(06 Marks)**

b. Find the Z-transform of i) sin(3n + 5) ii) $\frac{1}{(n+1)!}$. **(07 Marks)**

c. Solve the $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ with $y_0 = y_1 = 0$ using Z-transforms. **(07 Marks)**

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10ME32A

Third Semester B.E. Degree Examination, June 2012

Material Science and Metallurgy

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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PART – A

1 a. Explain the terms:
   i) Space lattice
   ii) Coordination number
   iii) Atomic packing factor **(06 Marks)**

b. Clearly explain different mechanisms of diffusion in solids. **(06 Marks)**

c. With neat sketches, explain vacancy and Schottky imperfection. Calculate the equilibrium number of vacancies per cubic meter for copper at 1000°C. The energy for vacancy formation is 0.9 ev/atom. The atomic weight and density (at 1000°C) for copper are 63.5 g/mol and 8.4 g/cm^3 respectively. (Boltzman's constant = 8.62×10^{-5} ev/K) **(08 Marks)**

2 a. Draw stress-strain diagram for a ductile material and explain the salient points. **(09 Marks)**

b. What do you mean by true stress and true strain? A cylindrical specimen of steel having an original diameter of 12.8 mm is tensile tested to fracture and found to have an engineering fracture strength σ_f of 460 MPa. If its cross sectional diameter at fracture is 10.7 mm, determine:
   i) The ductility in terms of percent area reduction.
   ii) The true stress at fracture. **(06 Marks)**

c. Differentiate between slip and twinning. **(05 Marks)**

3 a. Explain with sketches the ductile and brittle fracture in materials. **(07 Marks)**

b. Explain the following:
   i) S-N diagram
   ii) Fatigue properties **(06 Marks)**

c. Define creep. With the help of a neat diagram, explain the three stages of creep. **(07 Marks)**

4 a. Define nucleation. Distinguish between homogeneous and heterogeneous nucleation. **(07 Marks)**

b. What are solid solutions? Explain the factors governing the formation of substitution solid solution. **(07 Marks)**

c. State and explain Gibb's phase rule. How it can be applied to a unary phase diagram? Show that degrees of freedom at a triple point is zero. **(06 Marks)**

PART – B

5 a. Draw iron carbon equilibrium diagram and label all phase fields, temperatures and compositions on it. Discuss the different invariant reactions and draw the microstructure of 0.6% C steel at room temperature. **(14 Marks)**

b. What is a phase diagram? Clearly explain the different predictions that can be made from phase diagram. **(06 Marks)**

6 a. Explain the construction of TTT diagram. **(10 Marks)**

b. With a neat sketch explain the following heat treatment processes on steel:

i) Annealing

ii) Normalizing **(10 Marks)**

7 a. Write composition, properties and uses of:

i) S.G iron

ii) Malleable cast iron

iii) Grey cast iron **(12 Marks)**

b. Write short notes on:

i) Cupro nickel

ii) Bronzes **(08 Marks)**

8 a. What is a composite material? Discuss the role of matrix and reinforcement in a composite material. **(06 Marks)**

b. Compare MMCs with PMCs. **(06 Marks)**

c. Write a short note on FRPs. **(08 Marks)**

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10ME/AU/PM/TL33

Third Semester B.E. Degree Examination, June 2012
Basic Thermodynamics

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer FIVE full questions, selecting at least TWO questions from each part.***
2. Use of steam tables/thermodynamic tables permitted.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Distinguish between following with an example for each :
i) Intensive and extensive property
ii) Point and path function
iii) Quasistatic and actual process. **(12 Marks)**

b. The readings t_A and t_B of two Celsius thermometers A and B agree at the ice point (0°C) and steam point (100°C), but elsewhere they are related by the equation $t_A = l + mt_B + nt_B^2$, where *l*, m and n are constants. When both the thermometers are immersed in a well stirred bath, A registers 51°C whereas B registers 50°C. Determine the reading on B when A registers 25°C. **(08 Marks)**

2 a. Define thermodynamic heat and work. **(04 Marks)**

b. Derive an expression for displacement work for polytropic process. **(06 Marks)**

c. A spherical balloon has an initial diameter of 25cm and contains air at 1.2 bar. Because of heating, the diameter of the balloon increases to 30cm and during the heating process the pressure is found to be proportional to the diameter, calculate the work done during the process. **(10 Marks)**

3 a. State and derive an equation for steady state steady flow process. **(08 Marks)**

b. Show that energy is a property of system. **(06 Marks)**

c. Air flows steadily at the rate of 0.5 kg/s through an air compressor, entering at 7m/s velocity, 100 kpa pressure, and 0.95 m^3/kg volume and leaving at 5m/s, 700 kpa, and 0.19m^3/kg. The internal energy of the air leaving is 90 kJ/kg greater than that of the air entering. Cooling water in the compressor jackets absorbs heat from the air at the rate of 58 kW. Compute the rate of shaft work input to the air in kW. **(06 Marks)**

4 a. Give Kelvin-Plank and Clausius statements of second law of thermodynamics and show that they are equivalent. **(10 Marks)**

b. A reversible heat engine operates between two reservoirs at temperatures of 600°C and 40°C. The engine drives a reversible refrigerator which operates between reservoirs at temperature of 40°C and -20°C. The heat transfer to the heat engine is 2000 kJ and the network output of the combined engine refrigerator plant is 360 kJ.
Evaluate the heat transfer to the refrigerant and net heat transfer to the reservoir at 40°C. **(10 Marks)**

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PART – B

5 a. State and prove "Clausius inequality". **(06 Marks)**

b. Define entropy and prove that it is a property of a system. **(06 Marks)**

c. 2 kg of water at 80°C are mixed adiabatically with 3 kg of water at 30°C in a constant pressure process of 1 atmosphere. Determine the increase in entropy due to the mixing process. Assume for water $c_p = 4.187$ kJ/kg. **(08 Marks)**

6 a. Sketch and explain separating and throttling calorimeter to find out the dryness fraction of pure substance. **(08 Marks)**

b. Draw the phase equilibrium diagram for water on P-T coordinates indicating triple and critical point. **(04 Marks)**

c. Steam initially at 1.5 MPa, 300°C expands reversibly and adiabatically in a steam turbine to 40°C. Determine the ideal work output of the turbine per kg of steam. **(08 Marks)**

7 a. Show that for reversible adiabatic process PV^{γ} = constant with usual notations. **(05 Marks)**

b. Explain the following :

i) Maxwell's relations.

ii) Clausius-Clapeyron equation. **(08 Marks)**

c. 2 kg of air undergoes a polytropic process from 330K and 0.15m^3 to 550K and 0.02m^3. Determine : i) work transfer ; ii) heat transfer ; iii) change in enthalpy ; iv) change in entropy. **(07 Marks)**

8 a. Write a brief note on compressibility factor and compressibility chart. **(04 Marks)**

b. State Gibb's Dalton law of partial pressures and hence derive an expression for the gas R of a mixture of gases. **(06 Marks)**

c. A mixture of ideal gases consists of 3kg of nitrogen and 5kg of carbon dioxide at a pressure of 300kpa and a temperature of 20°C. Find :

i) Mole fraction of each constituent.

ii) The equivalent molecular weight of the mixture.

iii) The equivalent gas constant of the mixture.

iv) The partial pressure and partial volume.

v) The volume and density of the mixture. **(10 Marks)**

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10ME/AU/PM/TL34

Third Semester B.E. Degree Examination, June 2012
Mechanics of Materials

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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PART – A

1 a. Define: i) Poisson's ratio; ii) Modulus of rigidity; iii) Bulk modulus; iv) Factor of safety. **(04 Marks)**

b. Show that the extension produced due to self weight of a bar of uniform cross section fixed at one end and suspended vertically is equal to half the extension produced by a load equal to self weight applied at the free end. **(08 Marks)**

c. A member ABCD is subjected to point loads P_1, P_2, P_3 and P_4 as shown in Fig.Q.1(c). Calculate the force P_2 necessary for equilibrium, if P_1 = 45 kN, P_3 = 450 kN and P_4 = 130 kN. Determine the total elongation of the member, assuming the modulus of elasticity to be 2.1×10^5 N/mm^2. **(08 Marks)**

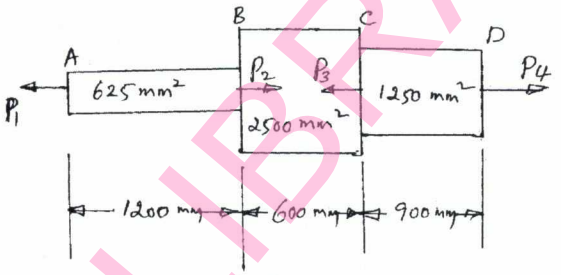

Fig.Q.1(c)

2 a. Define volumetric strain. A bar of uniform rectangular section of area A is subjected to an axial load P. Show that the volumetric strain is given by $\epsilon_v = \frac{P}{AE}\left(1 - \frac{2}{m}\right)$, where E is the Young's modulus and $\frac{1}{m}$ is the Poisson's ratio. **(04 Marks)**

b. The modulus of rigidity of a material is 0.8×10^5 N/mm^2 when a 6mm × 6mm rod of this material was subjected to an axial pull of 3600N, it-was found that the lateral dimension of the rod changed to 5.9991mm × 5.9991mm. Find the Poisson's ratio and the modulus of elasticity. **(06 Marks)**

c. A horizontal rigid bar AB weighing 200kN is hung by three vertical rods, each of 1m length and 500mm^2 in cross section as shown in figure Fig.Q.2(c). The central rod is of steel and the outer rods are copper. If the temperature rise is 40°C, estimate the load carried by each rod and by how much the load will descend.
Take:
$E_s = 200$ GN/m^2
$E_c = 100$ GN/m^2
$L_s = 1.2 \times 10^{-5}$ /°C
$L_c = 1.8 \times 10^{-5}$ /°C **(10 Marks)**

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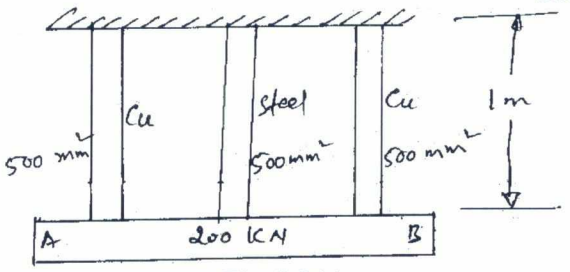

Fig.Q.2(c)

3 a. A rectangular bar is subjected to two direct stresses σ_x and σ_y in two mutually perpendicular directions. Prove that the normal stress (σ_n) and shear stress (τ) on an oblique plane which is inclined at an angle θ with the axis of minor stress are given by

$$\sigma_n = \frac{\sigma_x + \sigma_y}{2} + \frac{\sigma_x - \sigma_y}{2} \text{Cos}2\theta \quad \text{and} \quad \tau = \frac{\sigma_x - \sigma_y}{2} \text{Sin}2\theta.$$ **(08 Marks)**

b. A point in a strained material is subjected to stresses shown in Fig.Q.3(b). Using Mohr's circle, determine the normal and tangential stresses across the oblique plane. Check the answer analytically. **(12 Marks)**

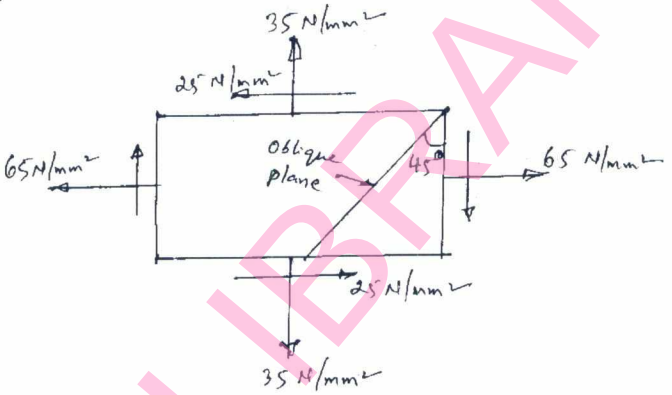

Fig.Q.3(b)

4 a. A cantilever of uniform section carries a point load at the free end. Find the strain energy stored by the cantilever and hence calculate the deflection at the free end. **(06 Marks)**

b. Calculate the i) Change in diameter; ii) Change in length and iii) Change in volume of a thin cylindrical shell 1000mm diameter, 10mm thick and 5m long when subjected to internal pressure of 3 N/mm^2. Take the value of E = 2×10^5 N/mm^2 and 1/m = 0.3. **(06 Marks)**

c. A pressure vessel with outer and inner diameters of 400mm and 320mm respectively is subjected to an external pressure of 8MPa. Determine the circumferential stress induced at the inner and outer surfaces. Prove that the longitudinal strain is constant through out the cylinder. **(08 Marks)**

PART – B

5 a. Define: i) Shear force; ii) Bending moment; iii) Point of cartraflexure. **(03 Marks)**

b. Draw shear force and bending moment diagrams for a simply supported beam subjected to couple at midspan, as shown in Fig.Q.5(b). **(05 Marks)**

Fig.Q.5(b)

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c. A cantilever beam is loaded as shown in Fig.Q.5(c). Draw the shear force and bending moment diagrams, for the beam. **(12 Marks)**

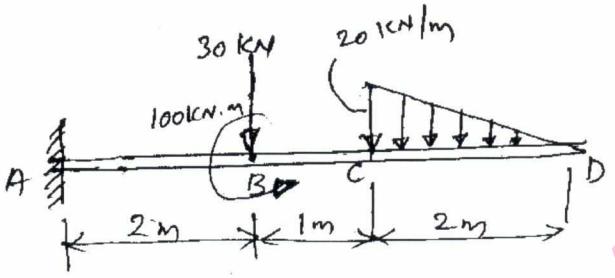

Fig.Q.5(c)

6 a. A simply supported beam of span 5m has a cross section 150mm × 250mm. If the permissible stress is 10 N/mm^2, find:
   i) Maximum intensity of uniformly distributed load it can carry.
   ii) The maximum concentrated load P applied at 2m from one end it can carry. **(10 Marks)**

   b. Prove that the maximum shear stress in a circular section of a beam is 4/3 times the average shear stress. **(10 Marks)**

7 a. Find the expressions for the slope and deflection of a cantilever of length L carrying uniformly distributed load over the whole length. **(08 Marks)**

   b. A horizontal girder of steel having uniform section is 14m long and is simply supported at its ends. It carries concentrated loads of 120kN and 80kN at two points 3m and 4.5m from the two ends respectively. 'I' for the section of the girder is 16 × 10^8 mm^4 and E_s = 210 kN/mm^2. Calculate the deflections of the girder at points under the two loads. Also find the maximum deflection. **(12 Marks)**

8 a. Derive the torsion equation with usual notations. State the assumptions made in the derivation. **(10 Marks)**

   b. Derive an expression for Euler's buckling load for a long column having one end fixed and other end hinged. State the assumption made in the derivation. **(10 Marks)**

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10ME/AU/PM/TL35

Third Semester B.E. Degree Examination, June 2012
Manufacturing Process – I

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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PART – A

1 a. Explain different pattern allowances. **(06 Marks)**
b. List out different patterns, explain any two of them. **(08 Marks)**
c. Explain the need and properties of additives. **(06 Marks)**

2 a. What CO_2 moulding? **(06 Marks)**
b. Compare : i) Jolt machine moulding and
ii) Squeeze machine moulding. **(09 Marks)**
c. Explain the working of 'Sand Slinger'. **(05 Marks)**

3 a. Sketch and explain the process 'shell moulding'. **(10 Marks)**
b. Explain the process of investment casting, with a neat sketch. **(10 Marks)**

4 a. Write a note on 'Coreless induction furnace' highlighting, i) the working principle ii) merits and demerits. **(10 Marks)**
b. With sketch, explain the working of 'cupola' **(10 Marks)**

PART – B

5 a. What is 'flux shielded metal arc' welding? **(04 Marks)**
b. With a sketch, explain the process of submerged arc welding. **(08 Marks)**
c. Sketch and explain 'atomic hydrogen welding'. **(08 Marks)**

6 a. Explain the basic principle of resistance welding. **(04 Marks)**
b. With sketch enumerate 'explosive welding processes. **(08 Marks)**
c. What is principle behind electron beam welding? **(03 Marks)**
d. Write a note on 'laser welding'. **(05 Marks)**

7 a. Explain the HAZ in welding process. **(07 Marks)**
b. How does the shrinkage and residual stress affect the welding joint? **(07 Marks)**
c. Write a note on causes and remedies of welding defects. **(06 Marks)**

8 a. Differentiate between: i) welding and soldering ii) soldering and brazing **(05 Marks)**
b. Explain "Magnetic particles inspection". **(05 Marks)**
c. What is ultrasonic inspection? **(05 Marks)**
d. Explain the technique of radiographic inspection. **(05 Marks)**

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MATDIP301

Third Semester B.E. Degree Examination, June 2012

Advanced Mathematics – I

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

1 a. Express $z = \frac{2-\sqrt{3}i}{1+i}$ in the form a + ib. **(06 Marks)**

b. Find modulus and amplitude of $z = \frac{3+i}{2+i}$. **(07 Marks)**

c. Find all the values of $z = \left(\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)^{3/4}$. **(07 Marks)**

2 a. Find the n^{th} derivative of $y = e^{ax}\cos(bx + c)$. **(06 Marks)**

b. If $y = \sin(m\sin^{-1}x)$ prove that $(1-x^2)y_{n+2} - (2n+1)x\,y_{n+1} + (m^2 - n^2)y_n = 0$. **(07 Marks)**

c. Expand $y = \log(1+x)$ in Maclaurins series upto 5th term. **(07 Marks)**

3 a. If $u = \frac{x^2y^2}{x+y}$, find the value of $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2}$. **(06 Marks)**

b. If $u = 3x^2 + y^2$ and $x^2 - y^2 = 1$, find $\frac{du}{dx}$. **(07 Marks)**

c. If $x = r\cos\phi$, $y = r\sin\phi$, $z = z$, find $\frac{\partial(x, y, z)}{\partial(r, \phi, z)}$. **(07 Marks)**

4 a. Obtain the reduction formula for $\int_0^{\pi/2}\sin^n x\,dx$ and hence obtain $\int_0^{\pi/2}\sin^4 x\,dx$. **(06 Marks)**

b. Evaluate $\int_0^1 x^2(1-x^2)^{7/2}dx$. **(07 Marks)**

c. Evaluate $\int_0^1\int_0^3 x^3y^3\,dx\,dy$. **(07 Marks)**

5 a. Evaluate $\int_0^1\int_0^2\int_0^3 (x+y+z)dz\,dy\,dx$. **(06 Marks)**

b. Evaluate $\int_0^\infty x^2e^{-4x}\,dx$ using gamma function. **(07 Marks)**

c. Find $\beta\left(\frac{5}{2}, \frac{3}{2}\right)$ in terms of gamma function.. **(07 Marks)**

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6 a. Solve the equation $\sqrt{1-y^2}\,dx + \sqrt{1-x^2}\,dy = 0$. **(06 Marks)**

b. Solve $\frac{dy}{dx} = \frac{x-y}{x+y}$. **(07 Marks)**

c. Solve $\frac{dy}{dx} = (x+y)^2$. **(07 Marks)**

7 a. Solve $\frac{dy}{dx} = \frac{\sin 2x - \tan y}{x \sec^2 y}$. **(06 Marks)**

b. Solve $\frac{d^2y}{dx^2} + x^2 y = x^2$. **(07 Marks)**

c. Solve $\frac{dy}{dx} + \sin xy = \sin x \cos x$. **(07 Marks)**

8 a. Solve $(D^2 + a^2)y = x^2$. **(06 Marks)**

b. Solve $(D^3 + D^2 - D - 1)y = e^{2x}$. **(07 Marks)**

c. Solve $(D^4 - 1)y = \sin x + 2$. **(07 Marks)**

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