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10MAT31

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Engineering Mathematics – III

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Obtain the Fourier series in $(-\pi, \pi)$ for $f(x) = x\cos x$. **(07 Marks)**

b. Obtain the Fourier half range sine series,

$$f(x) = \begin{cases} \frac{1}{4} - x & \text{in } 0 < x < \frac{1}{2} \\ x - \frac{3}{4} & \text{in } \frac{1}{2} < x < 1 \end{cases}.$$ **(07 Marks)**

c. Obtain the constant term and the coefficients of the first cosine and sine terms in the Fourier expansion of y from the table. **(06 Marks)**

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

2 a. Find the Fourier transforms of $f(x) = \begin{cases} 1 - x^2 & \text{for } |x| < 1 \\ 0 & \text{for } |x| \geq 1 \end{cases}$ and hence evaluate

$$\int_0^\infty \frac{x\cos x - \sin x}{x^3}\cos\frac{x}{2}\,dx.$$ **(07 Marks)**

b. Find the Fourier sine transform of $e^{-|x|}$. **(07 Marks)**

c. Find the inverse Fourier sine transform of $\hat{f}_s(\alpha) = \frac{e^{-a\alpha}}{\alpha}$, $a > 0$. **(06 Marks)**

3 a. Solve the wave equation $u_{tt} = c^2 u_{xx}$ given that $u(0,t) = 0 = u(2l,t)$, $u(x, 0) = 0$ and $\frac{\partial u}{\partial t}(x,0) = a\sin^3\frac{\pi x}{2l}$ **(07 Marks)**

b. Solve the boundary value problem $\frac{\partial u}{\partial t} = c^2\frac{\partial^2 u}{\partial x^2}$ $0 < x < l$, $\frac{\partial u}{\partial x}(0,t) = 0$, $\frac{\partial u}{\partial x}(l,t) = 0$, $u(x, 0)=x$. **(07 Marks)**

c. Obtain the D'Alembert's solution of the wave equation, $u_{tt} = C^2 u_{xx}$ subject to the conditions $u(x,0) = f(x)$ and $\frac{\partial u}{\partial t}(x,0) = 0$. **(06 Marks)**

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

x	0	1	2	3	4
y	1	1.8	1.3	2.5	2.3

b. Solve by using graphical method the L.P.P.
Minimize $z = 30x + 20y$
Subject to the constraints: $x - y \leq 1$
$x + y \geq 3$, $y \leq 4$
and $x \geq 0$, $y \geq 0$ **(07 Marks)**

c. Maximize $z = 3x + 4y$
subject to the constraints $2x + y \leq 40$, $2x + 5y \leq 180$,
$x \geq 0, y \geq 0$ using simplex method. **(06 Marks)**

PART – B

5 a. Find the fourth root of 12 correct to three decimal places by using regula Falsi method. **(07 Marks)**

b. Solve $9x-2y+z=50$, $x+5y-3z=18$, $-2x+2y+7z=19$ by relaxation method obtaining the solution correct to two decimal places. **(07 Marks)**

c. Find the largest eigen value and the corresponding eigen vector of, $\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ by using power method by taking initial vector as $[1 \quad 1 \quad 1]^T$. **(06 Marks)**

6 a. The table gives the values of tan x for $0.10 \le x \le 0.30$ **(07 Marks)**

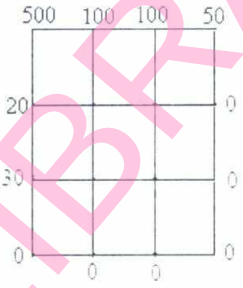
x	0.10	0.15	0.20	0.25	0.30
tanx	0.1003	0.1511	0.2027	0.2553	0.3093

b. Using Newton's forward and backward interpolation formula, calculate the increase in population from the year 1955 to 1985. The population in a town is given by, **(07 Marks)**

Year	1951	1961	1971	1981	1991
Population in thousands	19.96	39.65	58.81	77.21	94.61

c. Evaluate $\int_0^1 \frac{dx}{1+x}$ taking seven ordinates by applying Simpson's $\frac{3}{8}^{th}$ rule. Hence deduce the value of $\log_e 2$. **(06 Marks)**

7 a. Solve the Laplace's equation $u_{xx}+u_{yy}=0$, given that **(07 Marks)**



b. Solve $\frac{\partial^2 u}{\partial t^2}=4\frac{\partial^2 u}{\partial x^2}$ subject to $u(0,t)=0$; $u(4,t)=0$; $u(x,0)=x(4-x)$. Take h = 1, K = 0.5 upto Four steps. **(07 Marks)**

c. Solve the equation $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$ subject to the condition $u(x, 0) = \sin \pi x$, $0 \le x \le 1$, $u(0,t)=u(1,t)=0$ using Schmidt's method. Carry out computations for two levels, taking $h=\frac{1}{3}$, $K=\frac{1}{36}$. **(06 Marks)**

8 a. Find the z-transform of, (i) $\cosh n\theta$ (ii) $\sinh n\theta$ **(07 Marks)**

b. Obtain the inverse z-transform of, $\frac{4z^2-2z}{z^3-5z^2+8z-4}$. **(07 Marks)**

c. Solve the difference equation, $y_{n+2}+2y_{n+1}+y_n=n$ with $y_0=y_1=0$ using z-transforms. **(06 Marks)**

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10CV32

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Building Materials and Construction Technology

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What are the essential requirements of good foundation? **(05 Marks)**

b. What is safe bearing capacity of soil? Mention various methods to improve SBC of soil. **(06 Marks)**

c. Two loads of 1000kN and 1500kN are carried by square columns 500mm × 500mm and 600mm × 600mm respectively. The centre to centre distance between the columns is 5m. The footing is not to project more than 250mm beyond the outer edge of the smallest column. The allowable bearing capacity of the soil on which the columns are to rest is 250 kN/m^2. Determine the dimensions of the combined footing. **(09 Marks)**

2 a. Sketch the elevation of a brick wall build in i) English Bond ii) Flemish Bond. Compare the merits and demerits of English bond and Flemish bond. **(10 Marks)**

b. Draw neat sketches of the following and explain :
i) ASHLAR MASONRY ii) RUBBLE MASONRY. **(10 Marks)**

3 a. What are the advantages of an arch over a beam of same span? **(06 Marks)**

b. Sketch an R.C.C lintel for windows in brick masonry. Show arrangement of steel bars in it. **(06 Marks)**

c. Give the classification of arches and explain stability of an arch. **(08 Marks)**

4 a. Sketch a king post roof truss with timber, provided with tile roofing. Name various components of truss on the sketch. Indicate which members are subjected to compression and tension. **(08 Marks)**

b. What are the factors affecting choice of flooring material? **(06 Marks)**

c. What are the materials used for flooring? **(06 Marks)**

PART – B

5 a. Write a neat sketch of a door with a single shutter and its door frame. Name different components of frame and shutter. **(10 Marks)**

b. Explain along with neat sketch : i) Collapsible door ii) Bay window. **(10 Marks)**

6 a. State briefly the requirement of a good stair. **(05 Marks)**

b. Explain the different types of stairs. **(05 Marks)**

c. Plan of staircase hall of a public building is 6m long and 5.1m wide in plan. Vertical distance from flooring of ground floor to top level of flooring of first floor is 4.5m. Design the staircase with three flights. Sketch the staircase in plan and show details. **(10 Marks)**

7 a. Mention and explain different types of paints. **(10 Marks)**

b. What are the defects in plastering? **(05 Marks)**

c. What is pointing? Mention types of pointing. **(05 Marks)**

8 a. Define shoring. Explain different types of shoring. **(10 Marks)**

b. Explain Damp proofing. What are the causes of dampness? **(10 Marks)**

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10CV/EV33

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Strength of Materials

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define: i) Volumetric strain; ii) Hooke's law. **(04 Marks)**

b. Determine the net elongation of a circular bar of varying cross-section subject to forces as shown in Fig.Q.1(b). **(08 Marks)**

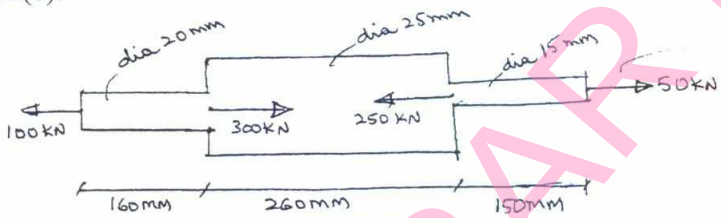

Fig.Q.1(b)

c. A bar of 30mm diameter in subjected to a pull of 60kN. The measured extension on a gauge-length of 200mm is 0.09mm and the change in diameter is 0.0039mm. Calculate the Poisson's ratio and the values of three elastic constants E, G, K. **(08 Marks)**

2 a. Define: i) Thermal stresses; ii) Factor of safety. **(04 Marks)**

b. Steel rails of a railway line one each 12m long. Determine the minimum gap between the rails so that no stress is developed, when there is a temperature raise of 25°C. Also determine the stress that would be developed in the rails if 40% of the expansion is prevented. Take E = 200GPa, $\alpha = 12 \times 10^{-6}$/°C. **(06 Marks)**

c. A composite tube consists of a steel tube 150mm internal diameter and 10mm thick and outer brass tube 170mm internal diameter and 10mm thick. The composite tube carries an axial load of 1000kN. Find the loads and stresses carried by each material. Also find the extension of the composite tube if the length is 150mm. Take E_s = 200GPa, E_b = 100GPa. **(10 Marks)**

3 a. Obtain the expression for normal stress and tangential stress on an oblique plane of a member subjected to an axial pull of P, on a plane inclined at an angle of θ to the normal plane. **(06 Marks)**

b. The state of stress at a point in a strained material is as shown in the Fig.Q.3(b). Determine:
i) The direction of principal planes.
ii) The magnitude of principal stresses.
iii) The magnitudes of the maximum shear stress and its direction.
Verify the results by constructing Mohr's circle. **(14 Marks)**

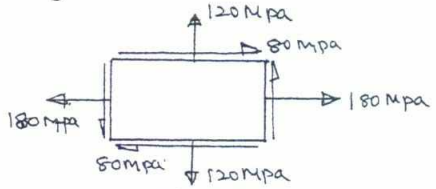

Fig.Q.3(b)

4 a. Derive the relationship between load intensity, shear force and bending moment. **(05 Marks)**

b. Draw SFD and BMD for a cantilever beam of span length 'l' carrying a point load w at its free end. **(05 Marks)**

c. Draw SFD and BMD for a simply supported beam carrying loads as shown in the Fig.Q.4(c). **(10 Marks)**

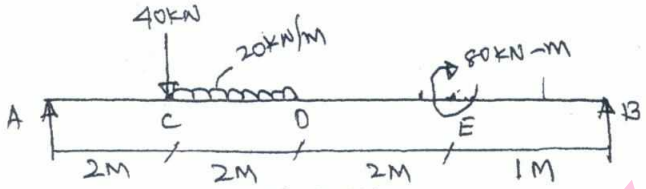

Fig.Q.4(c)

PART – B

5 a. Define the terms: i) Section modulus; ii) Neutral axis. **(04 Marks)**

b. Derive the equation of simple bending with usual notations. **(08 Marks)**

c. A circular pipe of external diameter 70mm and thickness 8mm is used as a simply supported beam over an effective length of 2.5m. Find the maximum concentrated load that can be applied at the centre of the span if the permissible stress on pipe is 150 N/mm^2. **(08 Marks)**

6 a. Derive the differential equation for beam deflection with usual notations. **(08 Marks)**

b. Determine the deflection under the loads for an overhanging beam carrying loads as shown in the Fig.Q.6(b). Take E = 200GPa, I = 45 × 10^6 mm^4. **(12 Marks)**

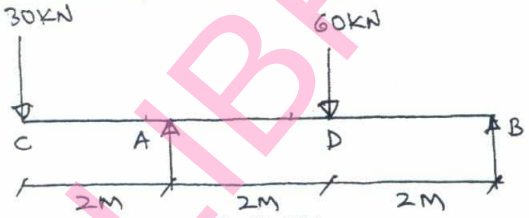

Fig.Q.6(b)

7 a. Define: i) Torsional rigidity; ii) Polar moment of inertia. **(04 Marks)**

b. Derive the pure torsion equation with usual notations. **(08 Marks)**

c. The working condition to be satisfied by a solid shaft transmitting power are i) The shaft must not twist more than 1° in a length of 15 times the diameter; ii) The shear stress must not exceed 80MN/m^2. What is the actual working stress and diameter of the shaft to transmit 736 kW power at 200rpm? Take shear modulus as 80 GN/m^2. **(08 Marks)**

8 a. Derive an expression for buckling load in a column subjected to an axial compressive load, when both ends of the column are hinged. **(08 Marks)**

b. A hallow cylindrical cast iron column whose external diameter is 200mm and thickness 20mm is 4.5m, long and is fixed at both ends. Calculate the critical load by Euler's formula. Find also the ratio of Euler's load to Rankine's load. Take E = 1 × 10^5 MPa, Rankine's constant = $\frac{1}{1600}$ and crushing strength = 550 N/mm^2. **(12 Marks)**

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10CV34

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Surveying – I

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Distinguish between precision and accuracy. **(04 Marks)**
b. Discuss in brief the basic principles of surveying. **(08 Marks)**
c. Differentiate between plane and geodetic surveying. **(08 Marks)**

2 a. Define ranging. Explain with a neat sketch the working of a line ranger. **(06 Marks)**
b. Explain the different methods of chaining on a sloping ground. **(06 Marks)**
c. A 30 m chain was used for the measurement of a distance. After chaining 900 m, the chain was found to be 12 cm too long and after chaining another 1800 m, it was found to be 18 cm too long, calculate the true distance if the chain was correct before commencement. **(08 Marks)**

3 a. Define chain surveying and explain the principle on which chain survey is based. **(06 Marks)**
b. Explain the various methods for determining the width of a river. **(06 Marks)**
c. In passing an obstacle in the form of a pond, stations A and D, on the main line were taken on the opposite sides of pond. On the left of AD, a line AB 200m long was laid down and a second line AC 250 m long was ranged on the right of AD. The points B, D and C being in the same straight line. BD and DC were then chained and found to be 125 m and 150 m respectively. Find the obstructed length AD. **(08 Marks)**

4 a. Distinguish between prismatic compass and surveyor's compass. **(08 Marks)**
b. Convert the following whole circle bearings to quadrantal bearings. i) 22°30′ ii) 170°12′ iii) 211° 54′ iv) 327°24′. **(04 Marks)**
c. Determine the values of included angles in the closed traverse ABCD conducted in the clockwise direction, given the following fore-bearings of their respective lines.

Line	FB
AB	40°
BC	70°
CD	210°
DA	280°

Apply the check. **(08 Marks)**

PART – B

5 a. What is local attraction? How it is detected and eliminated? **(10 Marks)**
b. The following bearings were observed with a compass.

Line	FB	BB
AB	74°0′	254°0′
BC	91°0′	271°0′
CD	166°0′	343°0′
DE	177°0′	0°0′
EA	189°0′	9°0′

Where do you suspect local attraction? Find the correct bearings. **(10 Marks)**

6 a. Define the following terms :
   i) Reduced level
   ii) Back sight
   iii) Level surface and
   iv) Line of collimation. **(04 Marks)**

   b. List and explain the temporary adjustments of a dumpy level. **(06 Marks)**

   c. Two points A and B are 1530 m apart across a wide river. The following reciprocal levels are taken with one level.

Level @	Reading on (m) A	B
A	2.165	3.810
B	0.910	2.355

The error in the Collimation adjustments of the level is –0.004m in 100 m. Calculate the true difference of levels between A and B and the refraction. **(10 Marks)**

7 a. Describe with the help of sketches at least eight characteristics of contours. **(08 Marks)**

   b. The following staff readings were observed successively with level, the instrument having been moved after 2nd, 4th and 8th readings.
   0.875, 1.235, 2.310, 1.385, 2.930, 3.125, 4.125, 0.120, 1.875, 2.030, 3.765. The first reading was taken with the staff held upon a bench mark of elevation 132.135 m. Enter the readings in the level-book form and reduce the levels. Apply the usual checks. Find also the difference in the level between the first and last point. **(12 Marks)**

8 a. Discuss the advantages and disadvantages of plane table surveying over other methods. **(08 Marks)**

   b. Define three-point problem and explain how it is solved by Bessel's graphical method. **(12 Marks)**

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10CV35

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Fluid Mechanics

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Give reasons for the following:
   i) Viscosity of the fluid decreases with increase in temperature.
   ii) Shape of water droplet is spherical.
   iii) Capillary rise occurs when glass tube is immersed in water.
   iv) Specific gravity is dimensionless. **(04 Marks)**

   b. Derive an expression for capillary rise in a glass tube immersed in water. **(08 Marks)**

   c. The space between two square flat plates of 800mm side is filled with an oil film of 20mm thickness. Lower plate is stationary and upper plate moves at a speed of 3.2m/s when 50N force is applied. Calculate:
   i) Shear stress
   ii) Dynamic viscosity of oil in poise
   iii) Kinematic viscosity of oil if G = 0.90. **(08 Marks)**

2 a. Differentiate between:
   i) Pressure intensity and pressure head
   ii) Simple and differential manometers
   iii) Absolute and gauge pressure. **(06 Marks)**

   b. Draw the neat sketch of Bourdon pressure gauge and explain the working. **(06 Marks)**

   c. An U-tube differential manometer connects two pipes A and B. Pipe A contains CCl_4(G = 1.59) under 130kN/m^2 gauge pressure. Pipe B contains oil (G = 0.82) under 200kN/m^2 gauge pressure. Pipe A is 2.5m above pipe B. The manometer contains mercury. Calculate the difference in mercury levels. Draw neat sketch. The level of mercury connected to pipe A is in level with center of pipe B. **(08 Marks)**

3 a. Derive an expression for total pressure and center of pressure on a plane surface immersed vertically in water. **(08 Marks)**

   b. A gravity dam shown in Fig.Q.3(b) withhold water to a depth of 10m. Upstream face of dam is vertical for 7m depth and inclined at 20° with vertical for the remaining height as shown in figure. Determine the pressure force on vertical and inclined faces per unit length of dam. Also locate their respective center of pressures. **(12 Marks)**

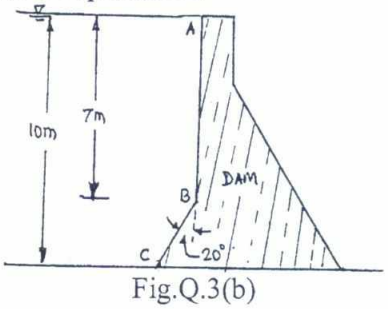

Fig.Q.3(b)

4 a. Define stream function and velocity potential function. Obtain Cauchy – Rieman equations. **(06 Marks)**

b. Derive continuation equation using stream tube. **(08 Marks)**

c. The velocity components for a 2D flow are $u = xy$ and $v = x^2 - \frac{1}{2}y^2$. Check i) whether they represent the possible flow case; ii) Whether flow is irrotational. **(06 Marks)**

PART – B

5 a. List the assumptions made in deriving Bernoulli's equation. **(06 Marks)**

b. Crude oil of G = 0.84 flows through a pipe with a rate of 450 lps. The diameter of pipe and pressure in the pipe at one section are respectively 25cm and 55kPa and at section two are 50cm and 320kPa. Find the direction of flow through pipe and head loss. Pipe is horizontal. **(06 Marks)**

c. A 300mm diameter pipe carries water under a head of 20m with a velocity of 3.5m/s. If the axis of the pipe turns through 45°, find the magnitude and direction of resultant force on the bend. **(08 Marks)**

6 a. Derive Darcy-Weisbach equation for head loss due to friction in a pipe. **(07 Marks)**

b. The rate of flow through a horizontal pipe is 0.03 m^3/s. Length of pipe is 1km. Diameter of pipe for first half of length is 20cm and suddenly enlarges to 40cm for the remaining length. Find the difference in water surface elevation in the two reservoirs connected to either side of pipe. Take f = 0.01 in equation $fLV^2/2gD$. Consider minor losses. **(08 Marks)**

c. The water is flowing with a velocity of 1.25m/s in a pipe of 2km length and 250mm diameter. The valve at the end of pipe is closed in 27sec. Find the rise in pressure. Take C = 1400m/s. **(05 Marks)**

7 a. Explain the measurement of depth using: i) Staff gauge; ii) Float gauge; iii) Self-recording gauge. **(12 Marks)**

b. Derive the expression for the point velocity using pitot tube. **(08 Marks)**

8 a. Derive an expression for discharge over a rectangular notch. **(08 Marks)**

b. List the advantages of triangular notch over rectangular notch. **(04 Marks)**

c. A horizontal venturimeter with inlet diameter 20cm and throat 10cm is used to measure the flow of oil (G = 0.8). The discharge is 60*l*/s, find the reading of oil-mercury differential manometer. $C_d = 0.98$. **(08 Marks)**

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10CV36

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017

Applied Engineering Geology

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What is geology? Briefly explain its important branches. **(06 Marks)**

b. What is seismology? Explain with a neat sketch the different parts of internal structure of the earth. Add a note on seismic waves role in understanding the structure and composition of the earth. **(14 Marks)**

2 Explain in detail how the physical properties of minerals are helpful in their identification in the field. **(20 Marks)**

3 a. What are igneous rocks? Explain with sketches the concordant and discordant igneous intrusive bodies. **(14 Marks)**

b. What is texture? Explain with sketches equigranular and inequigranular textures. **(06 Marks)**

4 Explain the following:

a. Epigene and hypogene geological agents

b. Preventive measures of landslides

c. Soil profile with a neat sketch.

d. Importance of weathering of rocks **(20 Marks)**

PART – B

5 Explain the following with neat sketches:

a. Horst and Graben structure

b. Compass clinometers and its uses

c. Denudational effects of anticlines and synclines

d. Angular unconformity and disconformity **(20 Marks)**

6 What is a DAM? With what purpose it will be constructed? Explain in detail the geological investigations of a good dam site. **(20 Marks)**

7 a. Write a note on hydrological cycle. **(05 Marks)**

b. What is an aquifer? Explain in detail the vertical distribution of ground water. **(10 Marks)**

c. Write a note on artificial recharge of ground water in rainwater harvesting. **(05 Marks)**

8 a. Explain the application of remote sensing in civil engineering practices. **(08 Marks)**

b. Discuss the impact of mining on geoenvironment. **(06 Marks)**

c. Write a note on porosity and permeability of different rocks. **(06 Marks)**

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MATDIP301

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Advanced Mathematics - I

Time: 3 hrs. Max. Marks:100

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

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

b. Find the cube roots of 1 - i. **(07 Marks)**

c. Prove that $\left(\frac{1+\cos\theta+i\sin\theta}{1+\cos\theta-i\sin\theta}\right)^n = \cos n\theta + i\sin n\theta$. **(07 Marks)**

2 a. Find the nth derivative of $e^{ax}\cos(bx+c)$. **(07 Marks)**

b. Find the nth derivative of $\frac{x}{(x-1)(2x+3)}$. **(06 Marks)**

c. If $y = a\cos(\log x) + b\sin(\log x)$ prove that $x^2y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$. **(07 Marks)**

3 a. With usual notations P.T $\tan\phi = \frac{rd\theta}{dr}$. **(06 Marks)**

b. Find the angle between the pairs of curves

$r = a\log\theta \quad r = \frac{a}{\log\theta}$. **(07 Marks)**

c. Find the Pedal equation to the curve $r = a(1+\sin\theta)$. **(07 Marks)**

4 a. State and prove Euler's theorem of Homogeneous functions. **(06 Marks)**

b. If $u = f(x-y, y-z, z-x)$

P.T $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}=0$. **(07 Marks)**

c. If $u = \tan^{-1}x + \tan^{-1}y$, $V = \frac{x+y}{1-xy}$

S.T $\frac{\partial(u,v)}{\partial(x,y)}=0$. **(07 Marks)**

5 a. Obtain the Reduction formula for $\int \sin^m x \cos^n x\,dx$. Where m, n are positive integers. **(07 Marks)**

b. Evaluate $\int_1^2\int_0^{2-x} xy\,dx\,dy$. **(06 Marks)**

c. Evaluate $\int_0^3\int_0^2\int_0^1 (x+y+z)\,dz\,dx\,dy$. **(07 Marks)**

6 a. Prove that $\left[\left(\frac{1}{2}\right)\right] = \sqrt{\pi}$. **(06 Marks)**

b. Prove that $\int_0^\infty x^2e^{-x^4}dx \times \int_0^\infty e^{-x^4}dx = \frac{\pi}{8\sqrt{2}}$. **(07 Marks)**

c. Evaluate the Integral $\int_0^1 x^5(1-x)^6\,dx$. **(07 Marks)**

7 a. Solve $(D^3 - 3D - 2)y = 0$. **(06 Marks)**

b. Solve $(y'' + y) = e^{-x} + \cos x + x^3$. **(07 Marks)**

c. Solve $y'' - 2y' + y = xe^x \sin x$. **(07 Marks)**

8 a. Solve $\frac{dy}{dx} = \frac{x(2\log x + 1)}{\sin y + y\cos y}$. **(06 Marks)**

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

c. Solve $(2xy + y - \tan y)\,dx + (x^2 - x\tan^2 y + \sec^2 y)\,dy = 0$. **(07 Marks)**

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