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R-11 / R-13

Code: 1GC31

II B.Tech. I Semester Supplementary Examinations October 2020

Mathematics-II

(Common to CE & ME)

Max. Marks: 70

Time: 3 Hours

Answer any **five** questions
 All Questions carry equal marks (**14 Marks** each)

1. a) If $\lambda_1, \lambda_2, \lambda_3, \dots, \lambda_n$ are the Eigen values of a matrix A, then prove that A^m has the Eigen values $\lambda_1^m, \lambda_2^m, \lambda_3^m, \dots, \lambda_n^m$ (m being a +ve integer) 7M
- b) find the Eigen values and Eigen vectors of $A = \begin{bmatrix} 4 & 3 \\ 2 & 9 \end{bmatrix}$ 7M

2. Obtain the Fourier series for $f(x) = \left(\frac{f-x}{2}\right)^2$ in $0 < x < 2f$ 14M

3. a) Form a partial differential equation by eliminating the arbitrary constants $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$. 7M
- b) Form a partial differential equation by eliminating the arbitrary function from $z = f(x^2 - y^2)$. 7M

4. Using Newton's Interpolation formula, find the values of $f(1.2)$ and $f(2.0)$, if

x	1	1.4	1.8	2.2
$f(x)$	3.49	4.82	5.96	6.5

14M

5. Using Taylor's series method, compute the value of y at $x=0.2$ and $x=0.4$ from $\frac{dy}{dx} = x + y; y(0) = 1$. 14M

6. Evaluate $\int_0^6 \frac{1}{1+x} dx$ by using (i) Trapezoidal rule, (ii) Simpson's 1/3 rd rule, (iii) Simpson's 3/8 rd rule 14M

7. Apply Cauchy's Riemann conditions to $f(z) = z^3$ and show that the function is analytic everywhere. 14M

8. Evaluate $\int_C \frac{1}{(z-1)(z-3)} dz$ with $C: |z| = 2$ using Cauchy's Integral Formula 14M

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R-11 / R-13

Code: 1G532

II B.Tech. I Semester Supplementary Examinations October 2020

Metallurgy and Material Science

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks each**)

1. a) Derive the relationship between atomic radius(r) and lattice parameter (a) for BCC materials. Calculate Atomic packing factor for such crystal structure. 7M
b) Explain point defects with neat sketches. 7M
2. a) What is a solid solution? What are the types of solid solutions? 7M
b) Explain Hume Rothery's rules for solid solutions 7M
3. a) Draw a neat sketch of typical eutectic phase diagram. Explain the important changes taking place while cooling for important compositions. 7M
b) Explain with neat sketch the Peritectic and eutectoid phase transformation of Fe-Fe₃C. 7M
4. a) Explain the structure, properties and applications of S.G Cast Iron. 7M
b) Write about properties of Plain carbon steels. 7M
5. a) Define hardenability? Explain how hardenability is tested for steel. 8M
b) Distinguish between Annealing and Normalizing. 6M
6. a) Give the classification aluminum alloys. Explain them briefly. 8M
b) Write short note on the following.
i) Gun Metal
ii) Aluminum Bronze
iii) Silicon Bronze 6M
7. a) What are composites? How do they differ from alloys? Write out the different matrix and reinforcements used for producing MMCs. 8M
b) Explain about Carbon – Carbon composites .Mention its applications 6M
8. Explain the Open Hearth Process of steel making. Also mention its advantages and limitations. 14M

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R-11 / R-13

Code: 1G533

II B.Tech. I Semester Supplementary Examinations October 2020

Thermodynamics

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

- Classify thermodynamics systems with a suitable example for each.
 - What do you understand by macroscopic and microscopic viewpoints? Explain.
- Define zeroth law of Thermodynamics. Explain how it is basis for the temperature measurement.
 - State first law of thermodynamics. Prove that internal energy is a property of the system.
- An inventor reports that he has developed an engine that operates between the temperature limits of 80°C and -17°C . During the process the engine absorbs 23×10^3 kJ/h of heat and develops 2 kW of power. Show with reason how far his claim is justified.
- Derive the four Maxwell's equations.
 - What is third law of Thermodynamics? State its significance
- Steam enters in an engine at a pressure of 10 bar absolute and 300°C . It is exhausted at 0.2 bar. The steam exhaust is 0.9 dry. Find
 - Drop in enthalpy,
 - Change in entropy
- Explain the significance of compressibility factor 'Z'. Determine the value of compressibility factor at critical point (Z_{cp}) for the Vander Waals' gas.
 - Discuss on Throttling and Free Expansion Processes
- State and prove Daltons law of partial pressures and Avogadro's law of additive volumes.
 - A gas mixture consists of 70 % N_2 and 30% CO_2 by mole basis. Determine gravimetric analysis of the mixture .
- In an Otto cycle air at 1bar and 280K is compressed isentropic ally until the pressure is 15bar The heat is added at constant volume until the pressure rises to 40bar. Calculate the air standard efficiency and mean effective pressure for the cycle. Take $C_v=0.717$ KJ/Kg K and $R_{univ} = 8.314$ KJ/Kg K
