

Subject Code: R16ME2101**II B.Tech I Semester Regular Examinations, Nov-2017.
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(ME)****Time: 3 hours****Max Marks: 60**Question Paper Consists of **Part-A** and **Part-B**.Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. a) List the differences between active and passive elements?
b) What are the applications of the DC series motor?
c) What is meant by Hysteresis loss? How to limit it?
d) Draw the slip-torque characteristics of induction motor?
e) What is a rectifier? List its applications?
f) What are the advantages of OP-Amplifier?

[2+2+2+2+2+2]

PART-B

2. a) Explain Star-delta transformation? [6M]
b) Three resistances 2 ohms, 4 ohms and 6 ohms are connected in series across 24V supply. Find the voltages across three resistors and current through each resistor. [6M]
3. a) Explain the necessity of starter in a DC motor and describe three point starter with a neat sketch. [6M]
b) An 8-pole lap connected armature has 40 slots with 12 conductors per slot generates a voltage of 500V. Determine the speed at which it is running if the flux per pole is 50mWb. [6M]
4. a) Derive an expression for the induced EMF of a transformer [6M]
b) Calculate the regulation of a transformer in which ohmic loss is 2% of the output and the reactance drop is 5% of the voltage when the power factor is (i) 0.8 lagging (ii) Unity and (c) 0.8 leading [6M]
5. a) Explain the principle of operation of an alternator. [6M]
b) The stator loss of a three phase induction motor is 2kW. When the power input is 90kW, what will be the rotor mechanical power developed and the rotor copper loss if the motor is running with a slip of 4%. [6M]
6. a) Explain in detail about the differences between PNP and NPN transistors? [6M]
b) Explain basic concept of a feedback amplifier? [6M]
7. a) Explain in detail about the Characteristics of operational amplifiers [6M]
b) Describe the non- inverting Op-Amplifier with circuit diagram and derive necessary expressions. [6M]

Subject Code: R16ME2102

II B.Tech I Semester Regular Examinations, Nov-2017.

MECHANICS OF SOLIDS

(ME)

Time: 3 hours

Max Marks: 60

Question Paper Consists of Part-A and Part-B.

Answering the question in Part-A is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1.

- What is the difference between normal stress and shear stress?
- What is the maximum bending moment in a cantilever beam of span 'L' carrying a UDL of intensity 'q' per unit length?
- List the various assumptions made in theory of simple bending?
- Why I section is preferred out of all cross sections in structural applications.
- What is a thin cylindrical shell? On what D/t ratio it is classified as a thin shell?
- Define torsional rigidity.

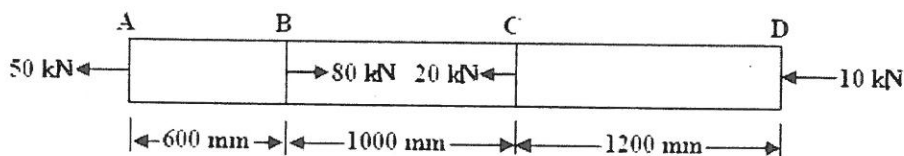
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PART-B

4 X 12 = 48

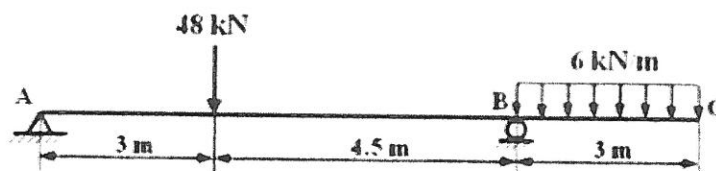
2. (a) A bar of 30 mm diameter is subjected to a pull of 60 kN. The measured extension on gauge length of 200 mm is 0.1 mm and change in diameter is 0.004 mm. Calculate i) Young's modulus ii) Poisson's ratio and iii) Bulk modulus [6M]

- (b) A brass bar having a cross sectional area of 1000 mm² is subjected to axial forces as shown in figure. Determine the total elongation of the bar if E = 105 GPa.



[6M]

3. An overhanging beam ABC supported at A and B and it overhangs from B to C and is loaded as shown in figure. Draw the shear force and bending moment diagrams.



[12M]

4. (a) What do you mean by section modulus? Find the expression for section modulus for rectangular, circular and hollow circular sections in usual notation. [6M]

- (b) A beam of circular section of 100 mm diameter is subjected to a shear force of 5 kN. Calculate
i) average shear stress ii) maximum shear stress. Also sketch the variation of shear stress along the depth of the beam. [6M]
5. a) A steel girder of I section supported over a span of 3.6m has $I_{xx}=1200 \times 10^4 \text{ mm}^4$. Determine the slope at ends and deflection at the centre of the beam, if central load is 16kN $E= 200\text{GPa}$. [5M]
b) Explain Macaulay's method with one example. [7M]
6. Derive Lami's Equations for thick cylinders [12M]
7. A hollow shaft having an internal diameter 60% of its external diameter transmits 450 kW power at 120 rpm. Determine the external diameter of the shaft if the shear stress is not to exceed 60 MPa and the twist in a length of 2.5 m should not exceed 1° . Take $G = 80 \text{ GPa}$. [12M]

Subject Code: R16ME2103

II B.Tech I Semester Regular Examinations, Nov-2017.

MATERIAL SCIENCE AND METALLURGY

(ME)

Time: 3 hours

Max Marks: 60

Question Paper Consists of Part-A and Part-B.

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

1.

PART-A

- (a) Define coordinate number. What is the coordinate number for BCC, FCC & HCP?
- (b) Differentiate between solvus line and solidus line?
- (c) What are cast Irons? Why are they named so?
- (d) What is full annealing?
- (e) Write short notes on Titanium and their alloys
- (f) What are the properties that are to be considered for good bonding between fibres and matrix

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PART-B

4 X 12 = 48

- 2.(a) Which is the most important of the Hume Rothery rules? Explain it with suitable example **6M**
(b) Discuss various types of bonds in solids and explain them and describe the reasons for high thermal and electrical conductivity in metallic bonded solids. **6M**
- 3.(a) Draw a neat sketch of Fe-Fe₃C diagram and label all important points, lines and phases in it. **6M**
(b) What is a lever rule? Explain it with an example? **6M**
- 4.(a) Why are alloying elements added to steels? Give some examples of common alloying elements and their effect on the properties of steel. **6M**
(b) Differentiate between gray cast iron and white cast iron? **6M**
- 5.(a) Schematically illustrate the quenching and tempering process of plain carbon steel. **6M**
(b) Briefly describe various surface hardening methods. **6M**
- 6. (a) Briefly explain the properties of copper and its classification and applications. **6M**
(b) Write about the corrosion resistance of aluminium alloys? **6M**
- 7.(a) What are abrasives? What properties are required for abrasive materials? Discuss types of abrasive materials **6M**
(b) Discuss different types of fibers and matrices used in fiber composite materials. **6M**



Subject Code: R16ME2104

II B.Tech I Semester Regular Examinations, Nov-2017

FLUID MECHANICS

(ME)

Time: 3 hours

Max Marks: 60

Question Paper Consists of Part-A and Part-B.

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B
All questions carry equal marks of 12.

PART-A

1. (a) State Newton's law of viscosity and give units for dynamic viscosity in CGS, MKS and SI system of units
- (b) Define stream line, path line, streak line and stream tube.
- (c). Define the terms Coefficient of velocity, Coefficient of contraction, Coefficient of discharge and Coefficient of resistance
- (d). State the principle of Venturi meter and give the expression for coefficient of discharge through it.
- (e). List out various minor losses.
- (f) Define the terms boundary layer thickness and momentum thickness.

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PART-B

4 X 12 = 48

2. (a) State and derive the Newton's Law of Viscosity and classify the fluids based on viscosity.
 - (b) Calculate the capillary rise in a glass tube of 2mm diameter when immersed vertically in (a) water and (b) mercury. Both the liquids being at 20° C and the values of the surface tensions for water and mercury at 20° C in contact with air are respectively 0.0725 N/m and 0.52 N/m. The contact angle may be taken as 0° and 130° for water and mercury respectively.
3. (a) Discuss the velocity and acceleration of fluid particle.
 - (b) Show that the two dimensional flow is continuous and Irrotational if velocity components are expressed as $u=6xy$ and $v=3x^2-3y^2$ also Obtain the expressions for stream function ψ and velocity potential ϕ .

4. (a) Derive Bernoulli's equation from Euler's equation of motion and Derive continuity equation.
- (b) A Pitot tube records a reading of 7.85 kPa as the stagnation pressure, when it is held at the centre of the pipe of 250 mm diameter conveying water. The static pressure in the pipe is 40 mm of mercury (vacuum). Calculate the discharge in the pipe assuming that the mean velocity of flow is 0.8 times the velocity at the centre. Take $C_d = 0.98$
5. (a) List the criteria for selecting repeating variable in this dimensional analysis?
- (b) Write short notes on the following:
- (i). Dimensionless Homogeneity with example.
 - (ii). Euler Model Law,
 - (iii). Similitude.
 - (iv). Undistorted and Distorted Models.
6. (a) Discuss the discharge when the pipes are (i) in series and (ii) in parallel.
- (b) A pipe 50 mm diameter is 6 m long and the velocity of flow of water in the pipe is 2.4 m/s. What loss of head and the corresponding power would be saved if the central 2 m length of pipe was replaced by 75 mm diameter pipe, the change of section being sudden? Take $f = 0.04$ for pipes of both diameters.
7. (a) Discuss boundary layer growth on flat plate.
- (b) The velocity distribution in the boundary layer is given by $\frac{u}{U} = 2 \left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$, δ being boundary layer thickness. Calculate the following (i) Displacement thickness (ii) Momentum thickness (iii) Energy thickness. Also calculate $\left(\frac{\delta^*}{\delta}\right)$.



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Subject Code: R16ME2105

II B.Tech I Semester Regular Examinations, Nov-2017.

THERMODYNAMICS

(ME)

Time: 3 hours

Max Marks: 60

Question Paper Consists of **Part-A** and **Part-B**.

Answering the question in **Part-A** is Compulsory & Four Questions should be answered from Part-B

All questions carry equal marks of 12.

PART-A

1. (a) What is meant by Quasi-static process.
- (b) Define Internal energy and Enthalpy?
- (c) Show that the COP of a heat pump is greater than the COP of a refrigerator by unity.
- (d) Why do the isobars on Mollier diagram diverge from one another?
- (e) Explain briefly about Dalton's law.
- (f) State the four processes of the Diesel cycle.

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PART-B

4 X 12 = 48

2. (a) What do you understand by thermodynamic equilibrium. Classify the systems briefly.
- (b) 680 kg of fish at 5°C are to be frozen and stored at -12°C. The specific heat of fish above freezing point is 3.182 kJ/kg-K and below freezing point is 1.717 kJ/kg-K. The freezing point is -2°C and latent heat is 234.5 kJ/kg. How much heat must be removed to cool the fish and what is the percent of latent heat in this.
3. (a) Derive an expression for Steady flow energy equation and apply for steam turbine and Boiler.
- (b) A fluid contained in a cylinder receives 150 kJ of mechanical energy by means of a paddle wheel, together with 50 kJ in the form of heat. At the same time, a piston in the cylinder moves in such a way that the pressure remains constant at 200 kN/m² during the fluid expansion from 2 m³ to 5 m³. What is the change in internal energy and in enthalpy?
4. (a) Establish the equivalence of Kelvin-Planck and Clausius statements.
- (b) Calculate the entropy change of the universe as a result of the following processes:
 - i) A copper block of 600 g mass and with C_p of 150 J/K at 100°C is placed in a lake at 8°C.
 - ii) The same block, at 8°C, is dropped from a height of 100 m into the lake.
 - iii) Two such blocks, at 100°C and 0°C are joined together.
5. (a) Explain the phase equilibrium diagram for a pure substance on a T-s diagram with relevant constant property lines.
- (b) A large insulated vessel is divided into two chambers, one containing 5 kg of dry saturated steam at 0.2 MPa and the other 10 kg of steam, 0.8 quality at 0.5 MPa. If the partition between the chambers is removed and the steam is mixed thoroughly and allowed to settle, find the final pressure, steam quality, and entropy change in the process.

6. (a) Define the following terms:

- | | |
|----------------------|-----------------------|
| i) Mass fraction | ii) Mole fraction |
| iii) Volume fraction | iv) Partial pressure. |

(b) 2.5 kg of N_2 at 15 bar and $40^\circ C$ is contained by a rigid vessel. Adequate quantity of O_2 is added to increase the pressure to 20 bar while the temperature remains constant at $40^\circ C$. Calculate the mass of O_2 added.

7. (a) Explain the working principle of Vapour compression refrigeration cycle with the help of p-h diagram.

(b) In an air standard Diesel cycle the compression ratio is 16 and at the beginning of isentropic compression, the temperature is $15^\circ C$ and the pressure is 0.1 MPa. Heat is added until the temperature at the end of constant pressure process is $1480^\circ C$. Calculate (a) Cut-off ratio (b) the heat supplied per kg of air (c) the cycle efficiency.
